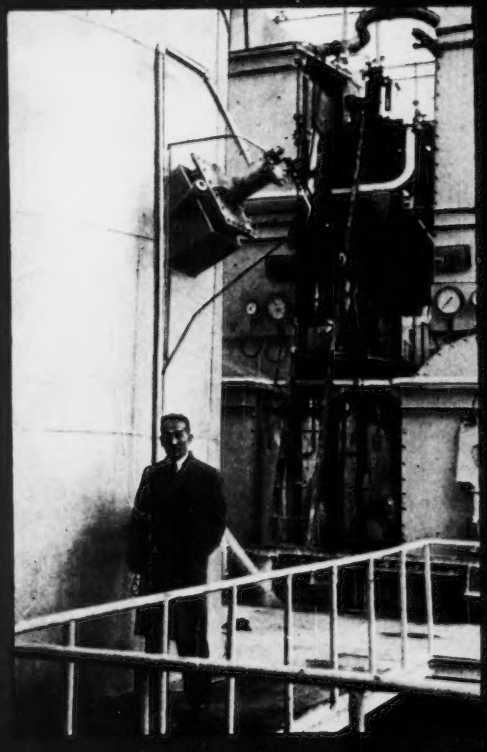
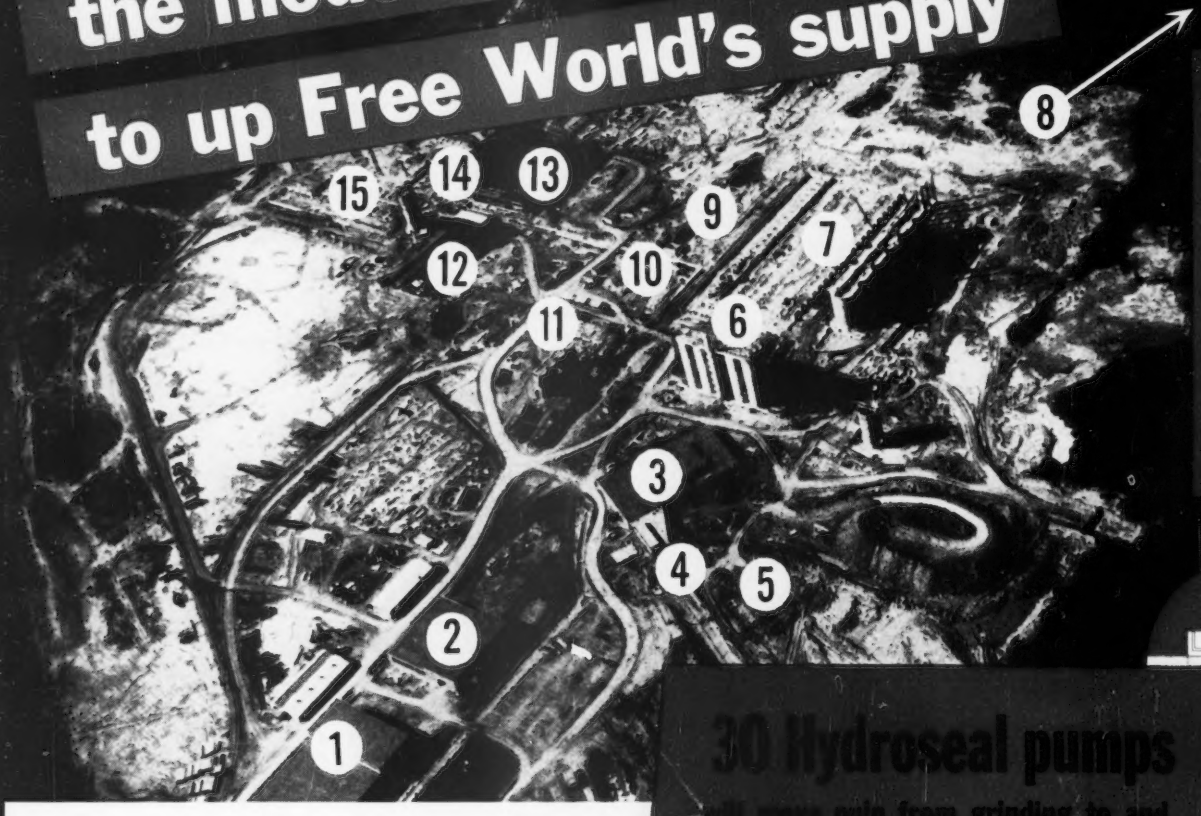
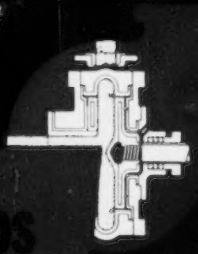
ENGINEERING AND MINING JOURNAL



White Pine Copper will use the modern proven techniques to up Free World's supply



1—Warehouse & machine shop
2—Vehicle Repair
3—Mine change & transfer house
4—Mine portal
5—Transfer station
6—Secondary & tertiary crushers
7—Mill building
8—Tailing pond
9—Thickener
10—Filter building
11—Flux crusher
12—Smelter feed & bedding bldg.
13—Power Plant
14—Reverberatory furnace
15—Smelter



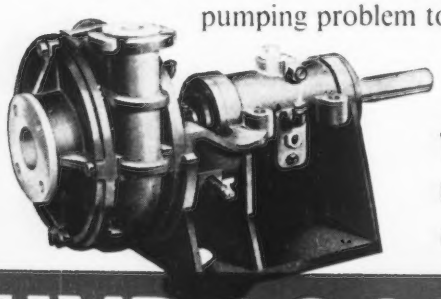
Air view of White Pine Copper Company's plant under construction southwest of Ontonagon, Michigan port on Lake Superior. Utilizing every modern facility, this largest post-war copper project is designed to mine 12,500 tons of ore daily on a 6-day schedule, to grind 10,500 tons daily on a 7-day cycle, and to add annually 75-million pounds of copper (99.9% purity) to U. S. production.

30 Hydroseal pumps

will move pulp from grinding to and through wet-way extraction processes

Six of the 30 Hydroseal Slurry Pumps will handle the overflow from 12 classifiers. Another six will feed Primary Deslimming cyclones. Four Hydroseals will serve for concentrate gathering. Six Hydroseals will distribute to regrind cyclones. Four Hydroseals will handle sand tailing, while four other Hydroseals will move slime tailing through separate discharge lines.

White Pine engineers insist that pumping be continuously efficient and economical. Their selection of Hydroseals is a good reason for referring *your* pumping problem to us.



Write today for new Hydroseal catalog.

THE ALLEN-SHERMAN-HOFF PUMP CO.

Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.

Representatives throughout the World

HYDROSEAL and CENTRISEAL

SAND, SLURRY & DREDGE PUMPS

MAXIMIX RUBBER PROTECTED

CARSET JACKBITS
now better than ever

BETTER CARBIDE
BETTER STEEL
BETTER PERFORMANCE

NOW ANOTHER MINE OPERATOR REPORTS AMAZING SAVINGS ON CARSET JACKBITS

Finds bit cost per foot of hole dropped 39½% in two years

The following figures are from actual performance records kept on Carset Jackbits by a large, cost-conscious, western mine operator. They show how Carset bit cost per foot of hole decreased more than a third inside of two years.

Year	Bit Cost Per Ft. Of Hole
1951	.043
1952	.029
1953	.026

This kind of performance reflects, conclusively, the important advances made in Carset Jackbit quality within the last few years . . . improvements that have made them the *hardest, toughest, longest-lasting bits obtainable today!*

These figures also show the savings you can expect when you use Carset Jackbits. You can get them now in a complete range of sizes from 1¼" to 3½".

Give Carsets a try — you'll be surprised at how much they can save you per foot of hole. Ask your I-R representative for a demonstration and be convinced.

SEND FOR THESE FREE WALL CHARTS

Helpful information for your drilling crews and shop men on how to get the most out of your bits. Ask your nearest I-R branch for Forms 4122A and 4121.

965-15

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ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL & GAS ENGINES

JANUARY 1954

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LETTERS TO THE EDITOR

Inquiries Abroad

SIR:

We find the catalogs . . . . listed in your journal interesting . . . . to our faculty and students . . . . and appreciate those which are arriving from some firms already (as we have requested).

DR. ING. V. KERSNIC
Professor, Mining and Metallurgy
Ljubljana, Yugoslavia

Oxidized Zinc Ores—Can They Be Floated?

. . . We Did It in France

SIR:

(I have written a letter direct) to Mr. William J. Wendt, author of the paper on ammonia leaching of oxidized zinc ore (*E&MJ*, September 1953).

Mr. Wendt wrote that flotation of oxidized zinc ores had not been successful so far and I point out to him that he is misinformed. For your information, I enclose copies of (my paper on "The Flotation of Oxidized Zinc Ores," presented before the London Institution of Mining and Metallurgy, Sept. 23-25, 1952).

MAURICE REY
Professor of Ecole Nationale,
Superieure des Mines de Paris

. . . In Italy, Too

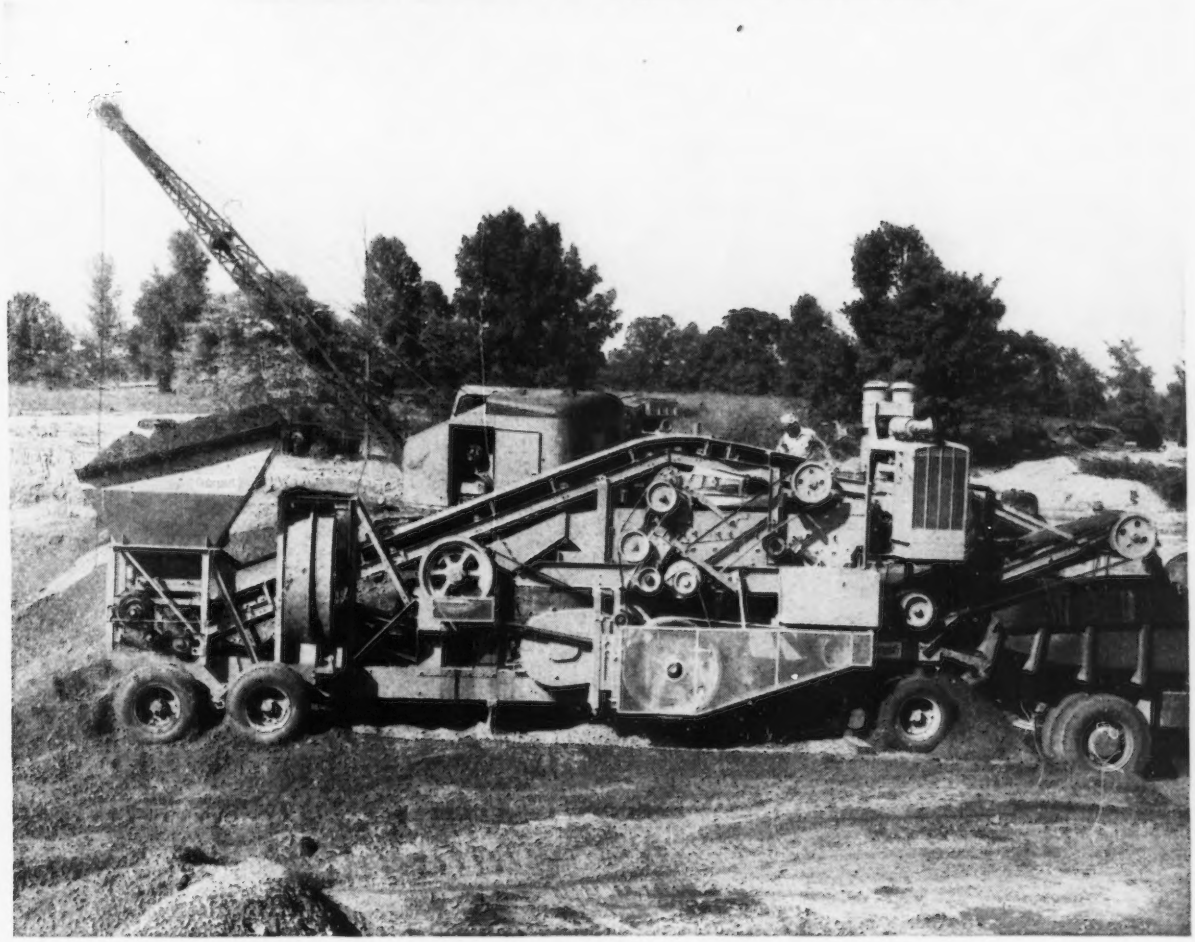
SIR:

In the September 1953 issue of *E&MJ* we have read the interesting report of Mr. W. J. Wendt but we don't agree with him that oxidized zinc minerals are not yet amenable to flotation.

Our 500-ton mill, a result of a remodeling job completed in 1952, is processing a zinc-ore in which all three minerals (smithsonite, hydro-

(Continued on page 160)

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Rubber moves jaws that chew rocks by the ton

A typical example of B. F. Goodrich improvement in rubber

INSIDE that mass of metal are big jaws that chomp like human teeth. But it's *rocks* they bite and grind—2000 tons a day—for building concrete roads! The jaws are powered by rubber belts and every time they grip and grind a new batch of rock, you can imagine the jerking jar that hits those belts. They were being broken and torn to shreds in days.

Looking for ways to save, the contractor tried a kind of belt new to him—Grommet V belts—developed and made only by B. F. Goodrich. A grommet is a cord loop inside the belt. It is made like a giant twisted cable except that it's endless—no splices or overlaps. The grommets make it a flexible belt but one that stands shocks and heavy loads far better than ordinary belts. No other kind of belt has grommets; no other belt stands so much punishment or lasts so long.

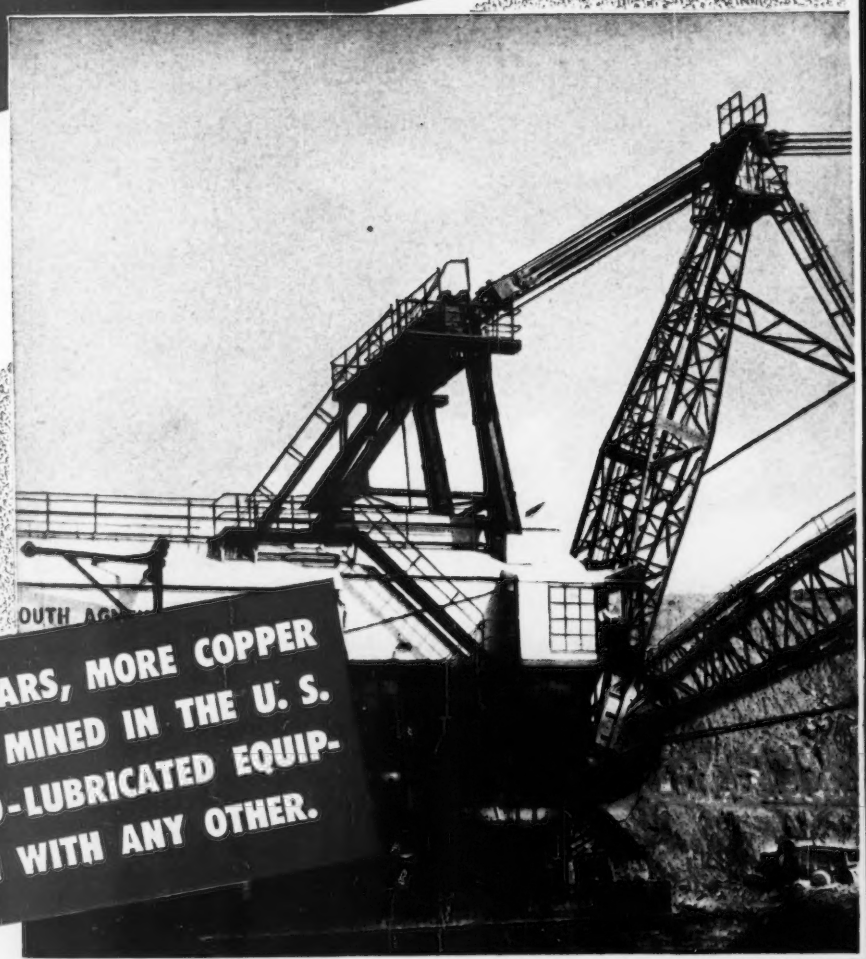
After the B. F. Goodrich Grommet V belts were installed, it was found they lasted *200% longer* than the belts used before—important money was saved, and time formerly needed for replacement could now be used in profitable production.

This performance is typical, not an unusual case at all. It's the result of a policy at B. F. Goodrich—the policy of constant product improvement, of never considering a product "good enough". If you use rubber belting, hose or other industrial rubber goods, it will pay you to check with your BFG distributor before you buy to see if you, too, can save money because of B. F. Goodrich research. Or write *The B. F. Goodrich Company, Dept. M-143, Akron 18, Ohio.*

Grommet—T. M. The B. F. Goodrich Co.

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

WIRE ROPE STAYS STRONG LONGER



FOR OVER 20 YEARS, MORE COPPER ORE HAS BEEN MINED IN THE U. S. WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER.

TUNE IN:
METROPOLITAN OPERA
radio broadcasts
every Saturday afternoon.
See newspaper for
time and station.

TEXACO

TEXACO
REG. T.M.

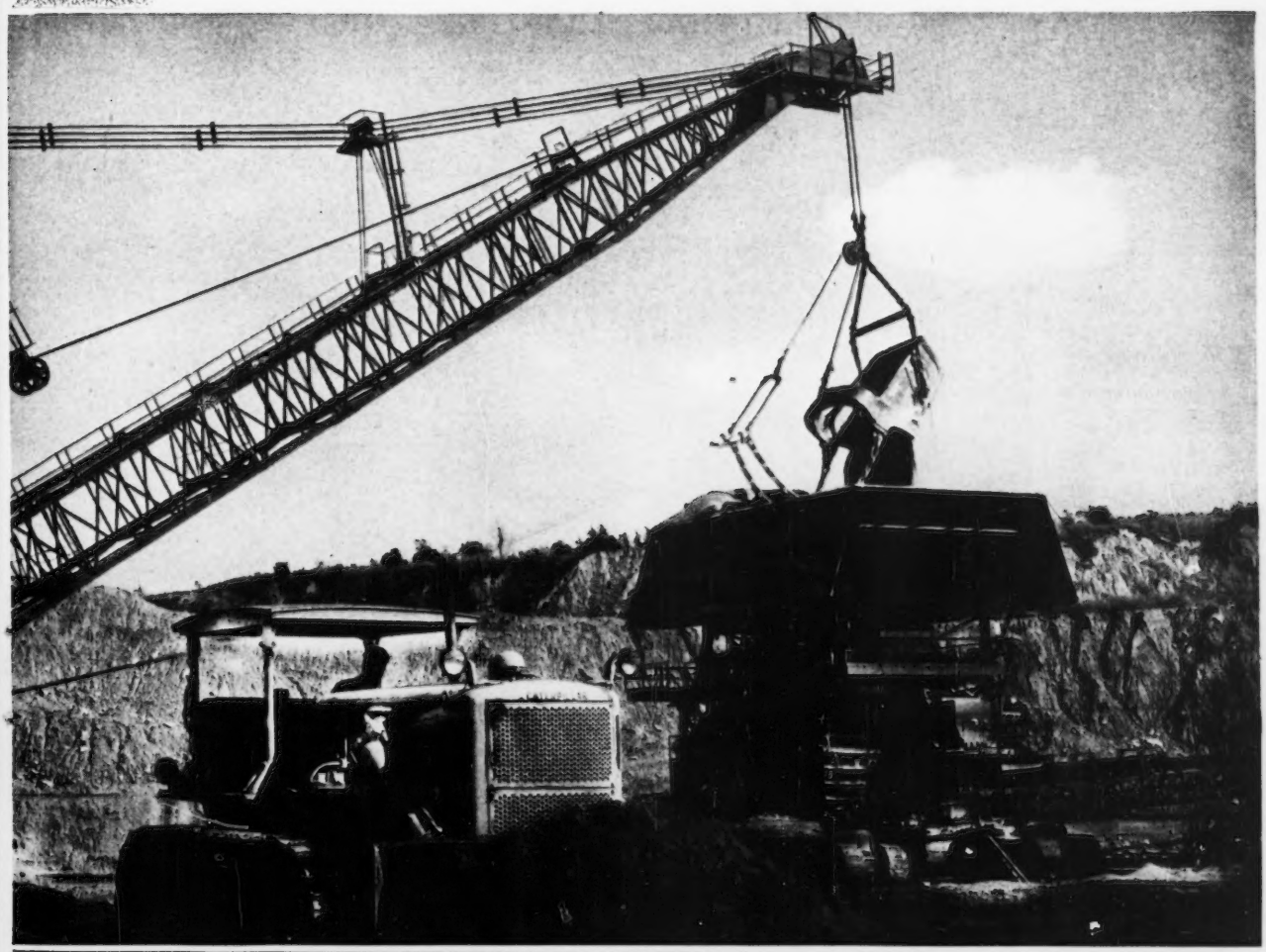
WHEN YOU USE *Texaco Crater*, your wire rope gets longer lasting protection against wear and rust. That's because *Texaco Crater* penetrates quickly and thoroughly — coats the wire strands with a tough, durable lubricating film; surrounds and preserves the hemp core. Your rope stays strong longer; your maintenance costs come down.

On open gears, *Texaco Crater* provides a tough, long-lasting film that assures smoother, quieter operation, longer gear life. If extra application convenience is wanted, use *Texaco Crater X Fluid* — ideal for both gears and rope. It *goes on* as a liquid (without heating) and *stays on* just like the regular *Texaco Crater*.

Lubricate mine car wheel bearings with *Texaco Olympian Grease* and obtain longer bearing life, reduced maintenance costs. This year-round lubricant minimizes starting and running drag — assures easy, smooth starts for trains *even at winter temperatures*.

Let a Texaco Lubrication Engineer show you how to effectively protect your equipment. Call the nearest of the more than 2,000 Texaco Distributing Plants in all 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



Lubricants and Fuels

FOR THE MINING INDUSTRY

AMERICAN ZINC PICKS

A Joy Jib Jumbo, as used for all track-type drifting, permits a two-man crew to drill an average of 154 feet per shift, using only 45% of their time on the drilling operation. Jib Jumbos mount two T-300 drifters on eight-foot chain feeds. Hydro Drill Jibs make drill positioning fast and easy.

A Joy Drillmobile, with a two man crew, drills an average of 220 to 240 feet per eight-hour shift. Drillmobiles now in use mount two Joy T-300 (3-inch) Drifters on ten-foot chain feeds, all on hydraulically-actuated Joy Hydro Drill Jibs. All drilling in trackless mining sections is done with Drillmobiles.

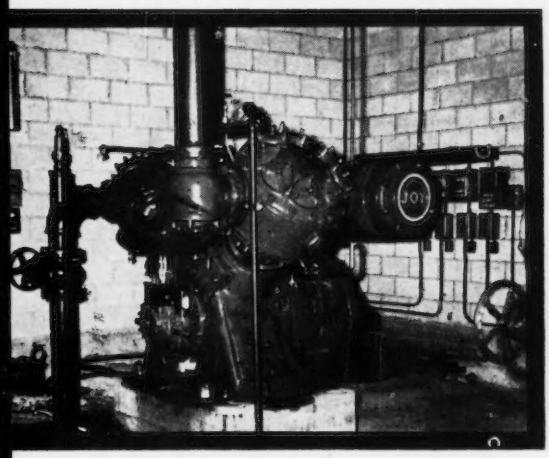
Air for mine ventilation is furnished by Joy Axivane Blowers, installed in the ventilation line as illustrated here. Additional Axivane Blowers are added in the line as necessary.

JOY EQUIPMENT

for

Joy CF-211 Slusher Hoist scraping ore into a glory hole in one of the large stopes of a Mascot mine.

EFFICIENT MINING AT NORTH FRIENDS STATION



For a dependable compressed air supply for this efficient mining operation, they selected Joy WN-112 two-stage, double-acting, heavy-duty compressors. The unit pictured here is the one most recently installed.

American Zinc Company of Tennessee, whose operations in Knox and Jefferson Counties have been described as among the country's most efficient, chose Joy equipment to help attain that efficiency at their North Friends Station Mine. Overall output has been boosted to 30 tons per man shift—including supervision—and production has been increased such that it compares favorably with some large open pit mines.

The help which American Zinc has gotten from the use of Joy equipment could also apply to your mining operation. Look at these examples of the use of Joy machines . . . then check on how they could help you.

Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.
In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

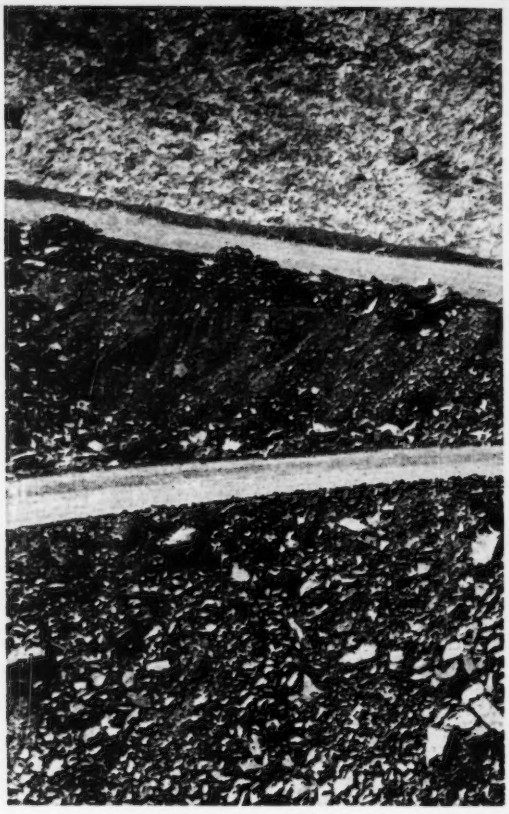
Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

W&P M4292

Haul 40 to 60 tons per load up 10 to 15% grades



Giant 50-ton Tournarocker is loaded with 7 to 8 passes of 5-yd. shovel. Large bowl (13' x 17') makes easy shovel target, speeds loading. With 90° power steer and electric controls, Tournarockers get under shovel faster, position for dump faster than conventional haulers. Tournarockers can turn around in 15'8" radius.

Big "A" Tournarockers

CORREALE CONSTRUCTION CO., Hazleton, Pa. — contract-stripping for Philadelphia & Reading Coal & Iron Co. at Minersville — has a rugged hauling job on its hands. Overburden and coal from a 140' anthracite vein must be trucked 3000' to one mile up continuous 10 to 15% grades. Because haul road moves frequently with the excavation, it is of temporary construction. It

Rig dumps 40 tons of coal into cleaner plant hopper in 17 seconds. Simple fingertip electric controls operate dump, shift, steer. Big 4-wheel air brakes (9408 sq. in., total braking surface) stop rig on a dime . . . assure perfect safety on hills.

Tournarockers swing around in a tight U-turn at the pit and back into loading position, 1 on either side of the shovel. Note how prime-mover and body tilt independently (up to 30° oscillating pivot) to eliminate twisting and strain.

High-speed, rubber-tired hauling • lifting • excavating •

Loaded with 40 tons of coal, Tournarocker climbs .6 mile of 10% grade on haul to cleaner plant. Special extension lip built at rear of bowl keeps coal from spilling out on uphill haul, and increases coal-carrying capacity by about 10 tons.

lick tough stripping job

is rough, bumpy . . . has several hairpin curves, and crosses a main highway. From 2500 to 3750 tons of coal alone must be hauled up the road to the plant daily. Also, the overburden that covers an equivalent tonnage must be moved.

4 "A's" do work of 11 trucks

Under these conditions, Correale hauls both shot rock overburden when stripping, and coal on the loading operation, with 4 king-sized 50-ton A Tournarockers. Where coal is handled, load time for 40 tons averages 3⅓ minutes. Load time for 50 to 60 tons of straight overburden averages 5 minutes. For coal loads, cycle of 1.2 miles to and from the cleaner plant takes 18.8 minutes, despite the steep grades, sharp switchbacks, and U-turn made to back into hopper channel. For overburden, cycle of 2 miles to spoil bank takes about 20 minutes. With this steady, high-speed performance, Correale reports they move as much rock and coal with their *four* 450 hp Tournarockers as they formerly hauled with *eleven* 15 to 22-ton trucks!

For low-cost, heavy-duty hauling . . . on or off the road . . . you'll want to get all the facts on Tournarocker. Available in sizes from 9 to 50 tons. Ask your LeTourneau Distributor for owner-verified reports covering work like yours. No obligation, of course.

Interesting facts on Correale's job

Depth of anthracite vein	140′
Present depth of cut	270′
Eventual depth of cut	340′
Quantity of coal removed to date	4,000,000 tons
Estimated coal still unworked	1,000,000 tons
Length of haul from pit	
For coal	0.6 mile
For overburden	1.0 mile
Nature of haul	All uphill, 10 to 15% grades
Hourly plant output, coal (90% handled by Tournarockers)	200 tons*
Average daily plant output (14-hour day)	2500 tons*
Record daily plant output (14-hour day	3750 tons*

*NOTE: Weight of processed coal only. Does not include stockpiled coal, nor rock overburden delivered with coal and removed from conveyor belt before weighing. Overburden hauled direct to spoil bank also not included.

What Correale operators say:

John McCann . . . "Tournarockers have lots of guts. We pull heaped loads up these steep grades in 2nd gear (6½ mph) — have power to spare. Electric controls don't give us a bit of trouble."

Cletus Tobin . . . "Tournarockers are a lot easier to handle than other haulers. You don't have to fight a steering wheel all day — just use that 'fingertip control'. You can turn around on a dime."

Stephen Autalosky . . . "There's nothing like Tournarockers for this hauling. I wouldn't want to drive a truck anymore. Fingertip controls sure save a lot of work for us drivers."

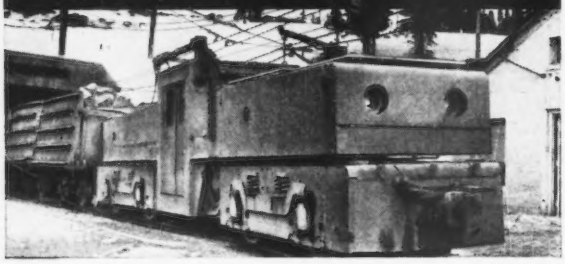
Tournarocker—Trademark Reg. U.S. Pat. Off. AR-302-CM

For information on purchase of LeTourneau-Westinghouse equipment for pounds sterling, see your local Distributor or write us direct.

equipment **LeTourneau-Westinghouse Company**

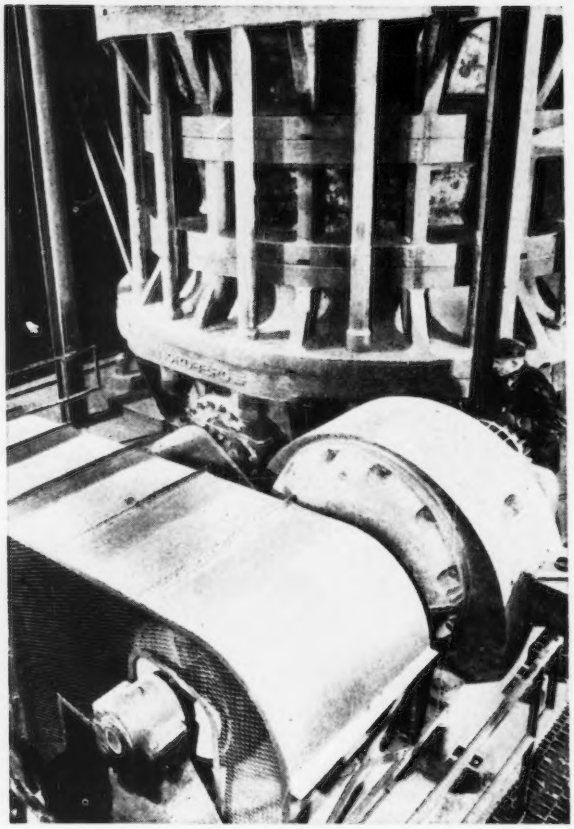
PEORIA, ILLINOIS

ENGINEERING REPORTS:



1 SEVEN SPECIALLY-DESIGNED 20-ton G-E mine locomotives provide maximum efficiency and safety. Center cab assures maximum visibility, is weather-proofed and heated.

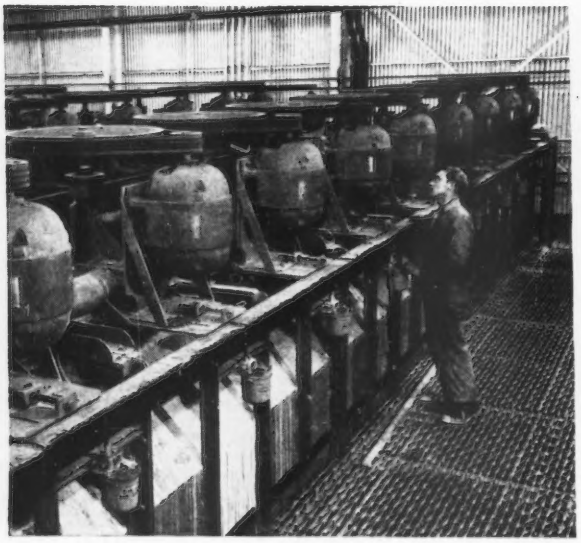
2 GREATER ORE HAULAGE is provided by fast, new G-E locomotives. Each pulls 20, 10-ton cars per trip—and increases the trips per day.



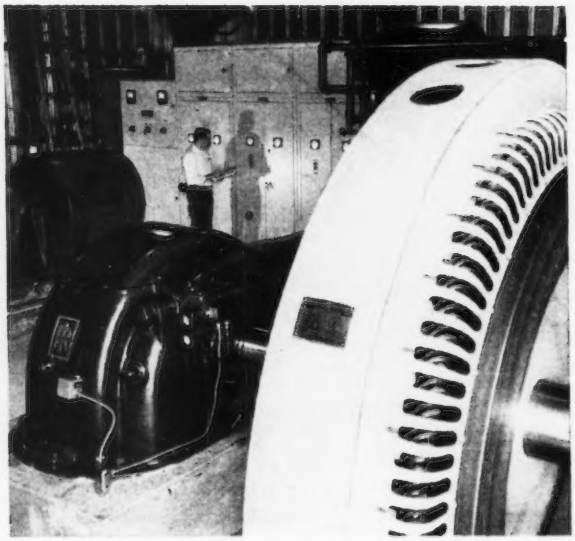
3 WORLD'S LARGEST GYRATORY CRUSHER, driven by dependable G-E 500-hp Tri-Clad* wound rotor motor, is a key feature of the Climax expansion program.

*Reg. trade-mark of the General Electric Company

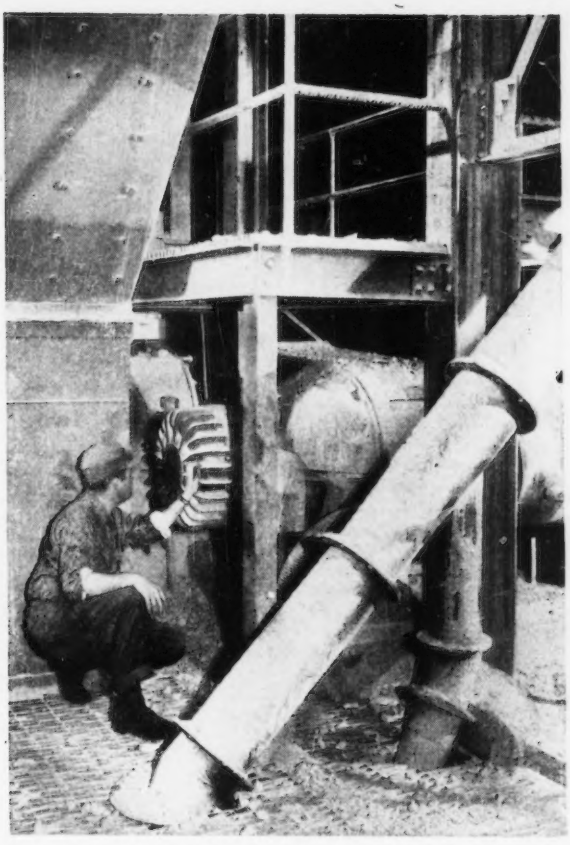
Climax Molybdenum expands,



7 HIGH EFFICIENCY is provided in flotation cells by G-E 7½-hp squirrel-cage motors—an important factor in round-the-clock operation. Convenient, individual oil-tight controls enable motors to be reversed when necessary.

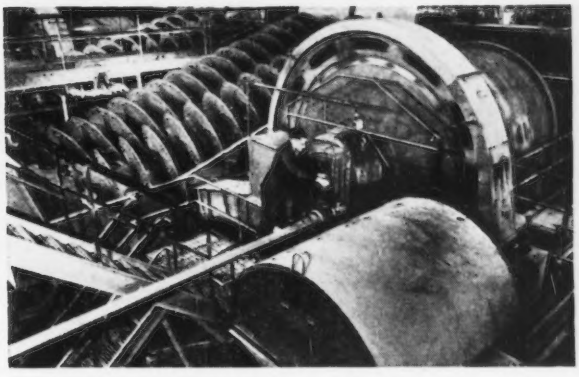


8 AIR COMPRESSORS at Storke Level are driven by G-E synchronous motors, one 500-hp and one 600-hp in foreground. D-c power for Storke Level locomotives is provided by 300-kilowatt G-E mg set through G-E control (background).



4 **SPECIAL CONE-CRUSHER DRIVE** assures a minimum of interruptions and less maintenance. Enclosed collectors on G-E Tri-Clad wound rotor motor helps protect against dust.

5 **PRODUCTION CONTINUITY** is provided by enclosed, heated conveyors driven by 350-hp and 250-hp motors. These carry ore from Storke Level crusher to final-stage crushing.



6 **HEAVY-DUTY G-E MOTOR**—500-hp, 300-rpm—under enclosure (foreground) drives this large ball mill which is in closed circuit with classifier.

hits record 23,000 tons a day

Co-ordinated G-E electrical system plays key part in setting record output of mine and mill

A multimillion-dollar expansion program now in process has enabled the Climax Molybdenum Company, Climax, Colo., to reach a record output of 23,000 tons of raw molybdenum ore per day. It will become one of the world's largest underground mines with a daily output of 28,000 tons when the program is completed. Instrumental in making this output record possible were General Electric application engineers who worked closely with Climax engineers to co-ordinate the project's electrical system.

In this remote mountain location, with operating points great distances apart, the G-E electrical system has helped integrate the mining and milling processes into a smooth-flowing production line. By providing reliable, 24-hour-a-day operation, co-ordinated G-E electrical systems helped to step up daily production as much as 5000 tons within the last two years—another example of the value of system planning.

The same G-E engineering leadership which helped Climax reach its record output is available to you for your expansion or modernization planning. Contact your Apparatus Sales Representative at your nearest G-E Apparatus Sales Office early in the planning stage. General Electric Co., Schenectady 5, N. Y.

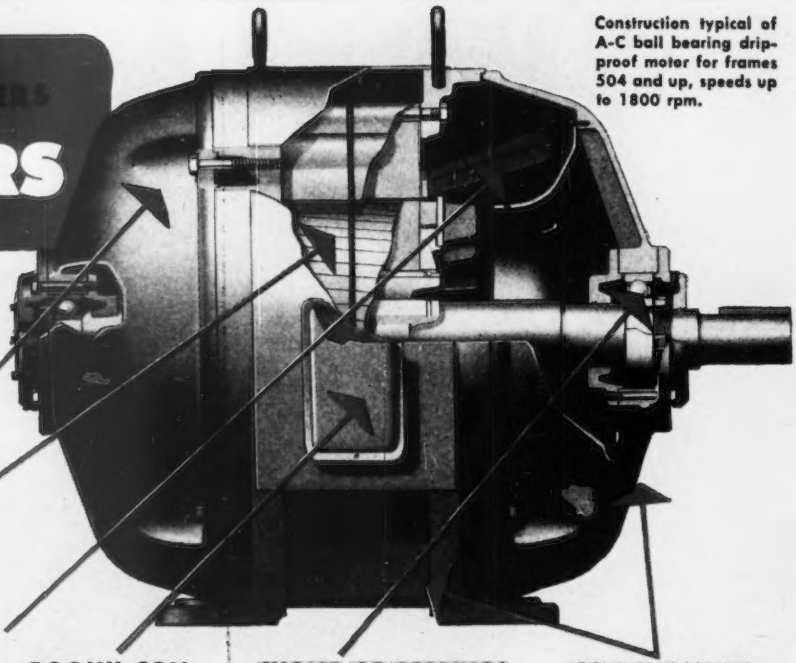
660-30

Engineered Electrical Systems for the Mining Industry

GENERAL ELECTRIC

ALLIS-CHALMERS

MOTORS



Construction typical of A-C ball bearing drip-proof motor for frames 504 and up, speeds up to 1800 rpm.

All These Features of Good Motor Design

CAST IRON END SHIELDS— assure distortion-free bearing support for maximum bearing life, correct rotor alignment, uniform air gap.

BRAZED CAGE WINDING — copper or copper alloy cage bars are brazed to end ring to produce a practically indestructible rotor winding.

STATOR COILS—multiple-dipped, baked after each dip. Build up tough protection against heat, moisture and corrosive atmosphere.

ROOMY CONDUIT BOX — has ample room for easy connection of leads, may be rotated in 90 degree steps.

CHOICE OF BEARINGS — motors may be obtained with either ball or ring-oiled sleeve bearings. Ball bearings are housing mounted with provisions for in-service lubrication.

EFFICIENT VENTILATION — large intake and discharge openings with ample-sized fan assure a sweeping flow of cooling air. Careful baffling of air flow and plenty of space back of stator core assure adequate, even cooling.

3 Extra Values

1 Nation-Wide Certified Service — Allis-Chalmers Certified Service Shops located throughout the country provide factory-approved parts and service on your Allis-Chalmers motors. A-C Certified Service Shops are independently owned shops that meet the strict A-C standards for modern equipment, experience, and business integrity. They provide you with prompt, economical repair and maintenance.

2 Complete Drive From One Source Allis-Chalmers can supply your complete drive — control — motor — *Texrope* V-belt drive — from one convenient source.

3 Competent Engineering Help Your local Allis-Chalmers District Office representative or Authorized Distributor will be glad to help you select exactly the right motor for your needs. For additional information, write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B6052.

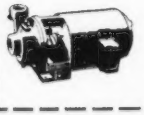
A-4227

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE V-belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.



PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

THINGS THAT MAKE NORTHWEST

a better shovel in the pit!

- Northwest Dual Independent Crowd utilizes force most other independent crowd shovels waste! Northwest Shovel Boom is powerful—all welded—proved in rock digging!
- Northwest positive traction while turning as well as when going straight ahead permits Northwests to travel where others have difficulty. Travel gears are fully enclosed and run in oil.
- Uniform Pressure Swing Clutches give smoother engagement, better control, less adjustment and longer life.
- Cast Steel Bases with Cast Steel Machinery Side Frames are typical of Northwest design for permanence of shaft alignment and rigidity.
- Ball and Roller Bearings on all high-speed shafts always have been standard equipment on Northwests.
- "Feather-Touch" Clutch Control utilizes engine power to throw heavy drum clutches and reduces day-end fatigue without resorting to delicate pumps, valves and compressors often requiring special engineering knowledge for proper adjustment.
- Cushion Clutch eliminates the effects of shock overloads to parts under power.
- All Northwests are easily convertible from Shovel to Crane, Dragline or Pullshovel.

NORTHWEST ADVANTAGES have been proved in years of mining service—on the Range, at Steep Rock, in copper in Utah—on a wide range of mining properties from coast to coast.

When you buy a Northwest you are buying a *real* Rock Shovel—equipment built to meet the punishment of the hardest kind of digging. It is designed to be easily cared for. It requires no special knowledge for its maintenance. It is smooth and fast in operation and its unusual steering advantages make it easy to handle on the benches and pit floor.

These are some of the reasons why Northwest speed is in some cases outproducing larger, slower units. Remember, you can't have Northwest advantages unless you own a Northwest.

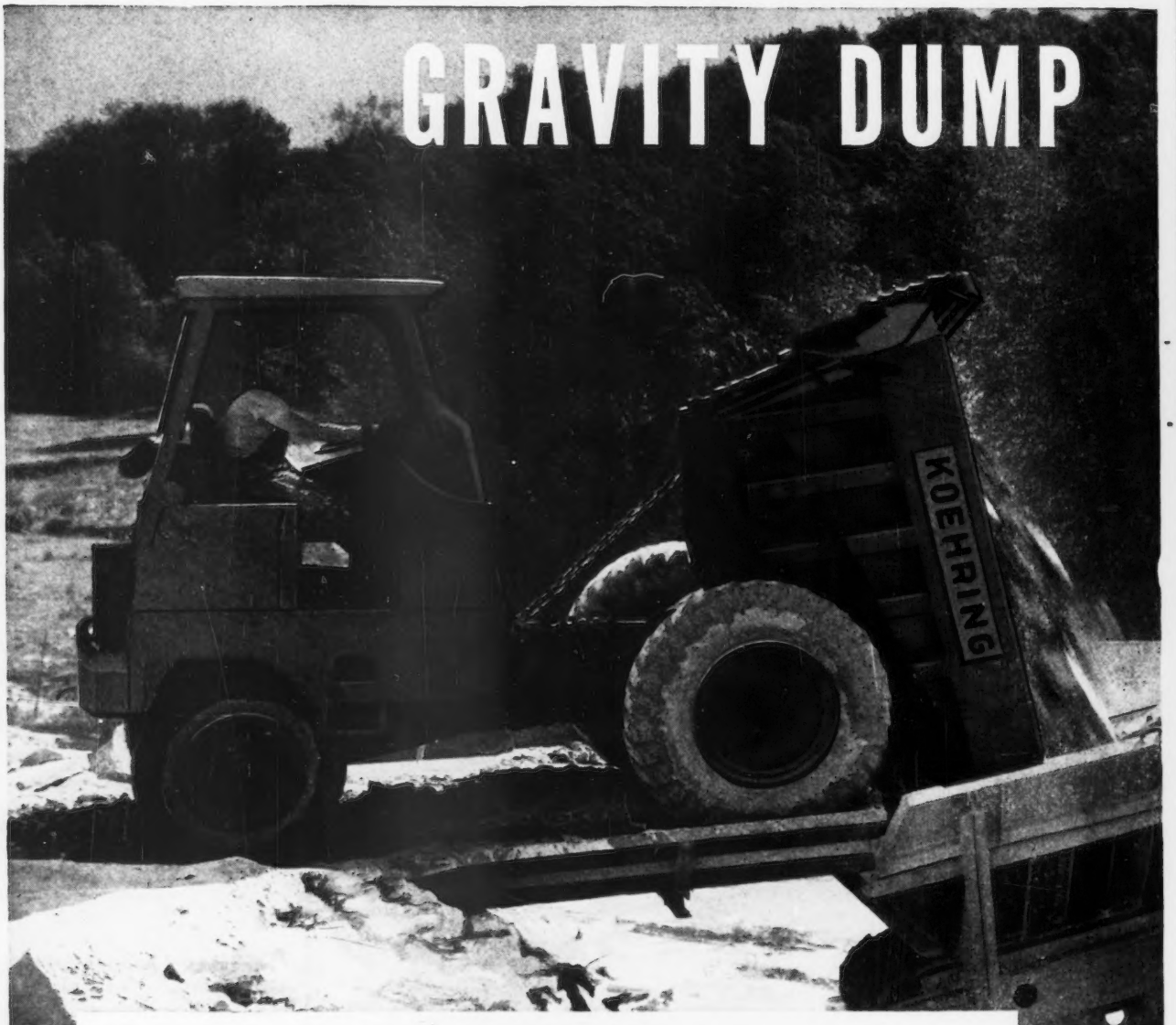
Now is the time to ask about Northwest. Why not have a Northwest Salesman call and tell you more about it? There is a size for almost every problem.

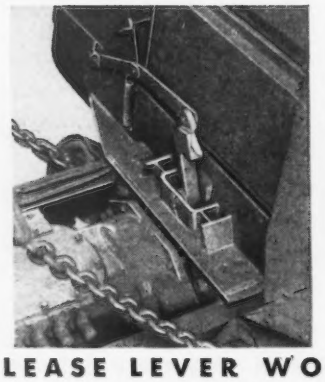
NORTHWEST ENGINEERING COMPANY
1509 Field Building, 135 South LaSalle Street, Chicago 3, Illinois

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

GRAVITY DUMP





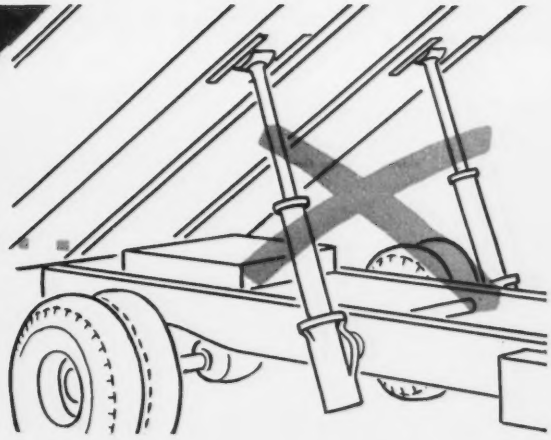
SIMPLE BODY RELEASE LEVER WORKS *INSTANTLY*

1 Body release lever is located in cab to left of steering wheel. Lever engages toggle linkage to latch hook on chassis . . .

2 Trip rod instantly releases latch hook from body latch seat on the tilting Dumptor body. Gravity dumps load instantly as . . .

3 Body rolls on heavy-duty rockers. Snub chains attached to big coil spring shock absorbers check body at 70-degree tilt.

eliminates body hoists. . . .



Koehring Dumptors®

have no slow-working body hoists. Operator trips the body-release lever . . . and gravity dumps the 6-yard load in just one second. It's as simple as that!

Saves 20 seconds every time you dump Because there is no waiting for slow-raising body hoists, one-second dumping saves 15 to 25 seconds dump-time on every cycle. This gives you more productive haul-time . . . earns an important increase in extra yards per hour.

Never balks . . . never wears out . . . There are no expensive hoist replacement parts, hoist maintenance or down time to eat into your profits. Koehring gravity dump is always instantaneous, trouble-free in all temperature extremes . . . never balks . . . never wears out.

No spring maintenance is another money-saving Dumptor advantage. There's just one big, double-coil chassis spring on steering axle, none on driving axle. Big shock-absorbing drive tires eliminate need for more springs . . . save spring maintenance time and replacement costs.

Check your body hoist and spring maintenance costs for a year. See how much you'll save when you haul with Koehring heavy-duty Dumptors. Get all the facts from your Koehring distributor soon . . . or write us for 28-page Dumptor catalog.

KOEHRING COMPANY

MILWAUKEE 16, WISCONSIN

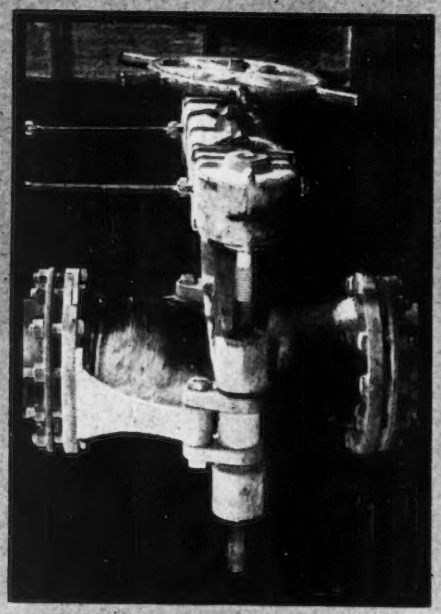
KOEHRING HEAVY DUTY

Subsidiaries: PARSONS · KWIK-MIX · JOHNSON

K341

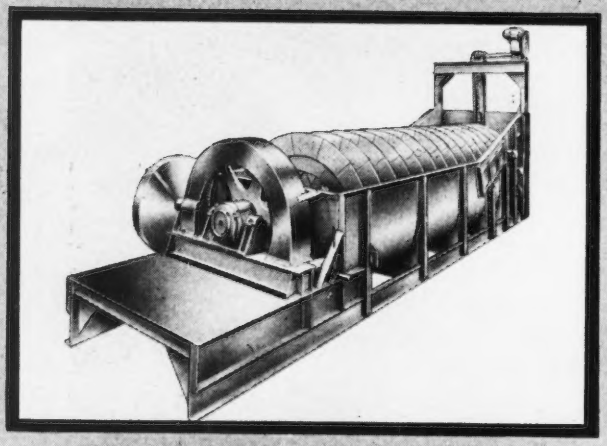
at New Jersey Zinc,

MARCY MILLS



MASSCO-GRIGSBY
RUBBER PINCH VALVES

WILFLEY TABLES



AKINS CLASSIFIERS

too . . .

Like so many other successful mining companies, The New Jersey Zinc Co. relies on M & S and CIW products for dependable low-cost mechanical operation and efficient metallurgical performance.

M & S and CIW at NEW JERSEY ZINC

GILMAN

4—54" Akins Simplex Classifiers
1—24" Akins Simplex Classifier
4—4' x 10' Marcy Rod Mills
2—2' x 4' Marcy Rod Mills

DEPUE

1—5' x 10' Marcy Rod Mill

OGDENSBURG

1—3' x 6' Marcy Rod Mill

HANOVER

3—54" Akins Simplex Classifiers

PALMERTON

1—5' x 10' Marcy Rod Mill
1—5' x 12' Marcy Rod Mill

AUSTINVILLE

2—8' x 12' Marcy Rod Mills

FRANKLIN

3 6 —Wilfley Tables

LET OUR ENGINEERS SHOW YOU THE REASON WHY SO MANY COMPANIES CHOOSE MARCY AND AKINS...SEE PROVED RESULTS FROM ALL KINDS OF GRINDING AND CLASSIFICATION INSTALLATIONS.

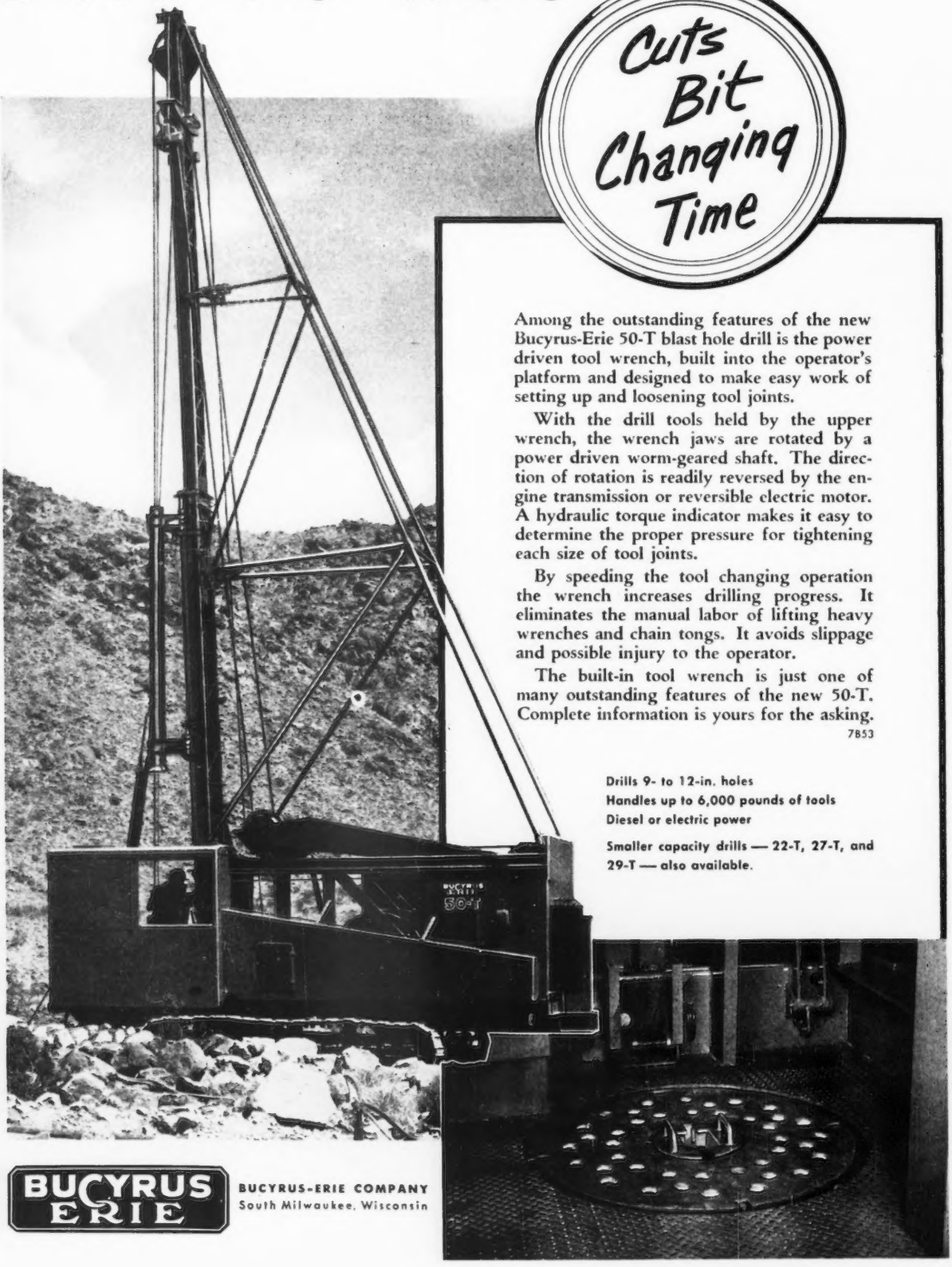
The Mine & Smelter Supply Co.

Denver 17, Colorado

OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N. Y. C.
AND ITS SUBSIDIARY COMPANY **COLORADO IRON WORKS CO.**
Denver 2, Colorado

Sales Agents and Licensed Manufacturers in Foreign Countries

Built-In Tool Wrench



Among the outstanding features of the new Bucyrus-Erie 50-T blast hole drill is the power driven tool wrench, built into the operator's platform and designed to make easy work of setting up and loosening tool joints.

With the drill tools held by the upper wrench, the wrench jaws are rotated by a power driven worm-geared shaft. The direction of rotation is readily reversed by the engine transmission or reversible electric motor. A hydraulic torque indicator makes it easy to determine the proper pressure for tightening each size of tool joints.

By speeding the tool changing operation the wrench increases drilling progress. It eliminates the manual labor of lifting heavy wrenches and chain tongs. It avoids slippage and possible injury to the operator.

The built-in tool wrench is just one of many outstanding features of the new 50-T. Complete information is yours for the asking.

7B53

Drills 9- to 12-in. holes
Handles up to 6,000 pounds of tools
Diesel or electric power

Smaller capacity drills — 22-T, 27-T, and 29-T — also available.

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

6.1 MILE SHORT CUT

sets earth-moving records!

HARD ROCK LUG for tire-killing work.

SURE-GRIP — top choice for traction.

ALL-WEATHER for maximum flotation.

Sure-Grip, All-Weather—T. M.'s
The Goodyear Tire & Rubber Company, Akron, Ohio

IN THE HEART OF THE GREAT SMOKIES, between Black Mountain and Old Fort, two new 22-foot pavements with 4-foot center strip and 10-foot shoulders, have at last replaced a dangerous bottleneck.

The contract called for blasting and slicing record cuts through mountaintops—and phenomenal fills—but the W. E. Graham Construction Company of Cleveland, N. C., moved 3½-million cubic yards in less than three-quarters of the time estimated!

Not bad for a job that included an 880,000 cubic-yard fill, a 440,000 cubic-yard cut, up to 350-foot differences between fill bottoms and pregraded knolls (all within 450 feet of roadway)—and a 173-foot-deep fill over a 66" x 576' culvert!

IT's jobs like these that make contractors glad that "GOODYEAR IS THERE"—all there—with rugged, strong-pulling, long-enduring tires—specifically designed to do the best, most economical job on each piece of equipment.

That's why you'll find Goodyears "there" on so many tough jobs—*specified* by the men who keep those tough jobs rolling at lowest tire-cost per yard! Goodyear, Truck Tire Dept., Akron 16, Ohio.

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE!

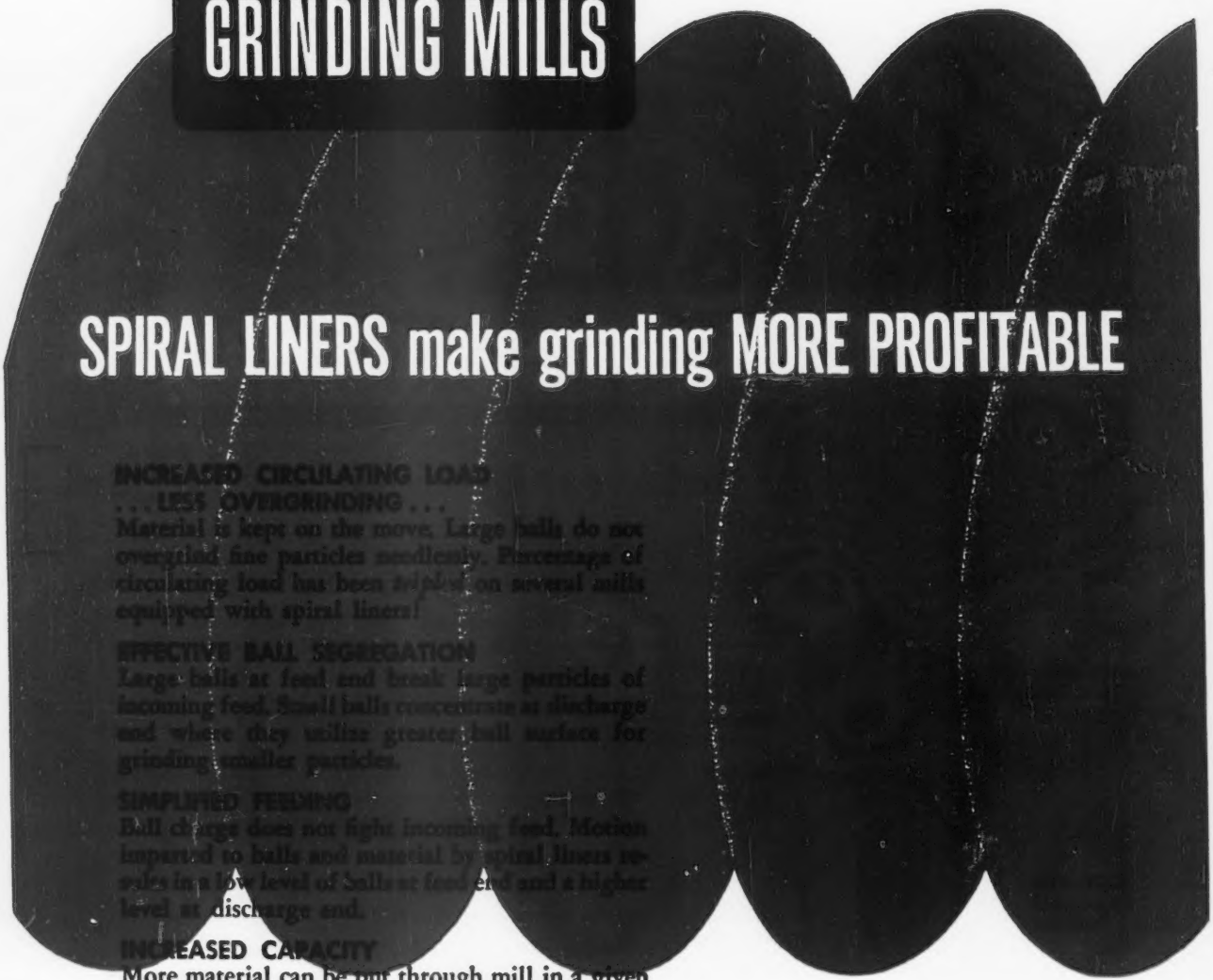
GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

ALLIS-CHALMERS

GRINDING MILLS

SPIRAL LINERS make grinding MORE PROFITABLE



INCREASED CIRCULATING LOAD
. . . LESS OVERGRINDING . . .
Material is kept on the move. Large balls do not overgrind fine particles needlessly. Percentage of circulating load has been stepped on several mills equipped with spiral liners!

EFFECTIVE BALL SEGREGATION
Large balls at feed end break large particles of incoming feed. Small balls concentrate at discharge end where they utilize greater ball surface for grinding smaller particles.

SIMPLIFIED FEEDING
Ball charge does not fight incoming feed. Motion imparted to balls and material by spiral liners results in a low level of balls at feed end and a higher level at discharge end.

INCREASED CAPACITY
More material can be put through mill in a given time. Retention time of material in the mill is reduced. Power cost is less — no power is wasted on overgrinding . . . ball segregation increases efficiency.

For application of spiral liners to your grinding mill, call the Allis-Chalmers representative in your area, or write Allis-Chalmers, Milwaukee 1, Wis.

A-4155

ALLIS-

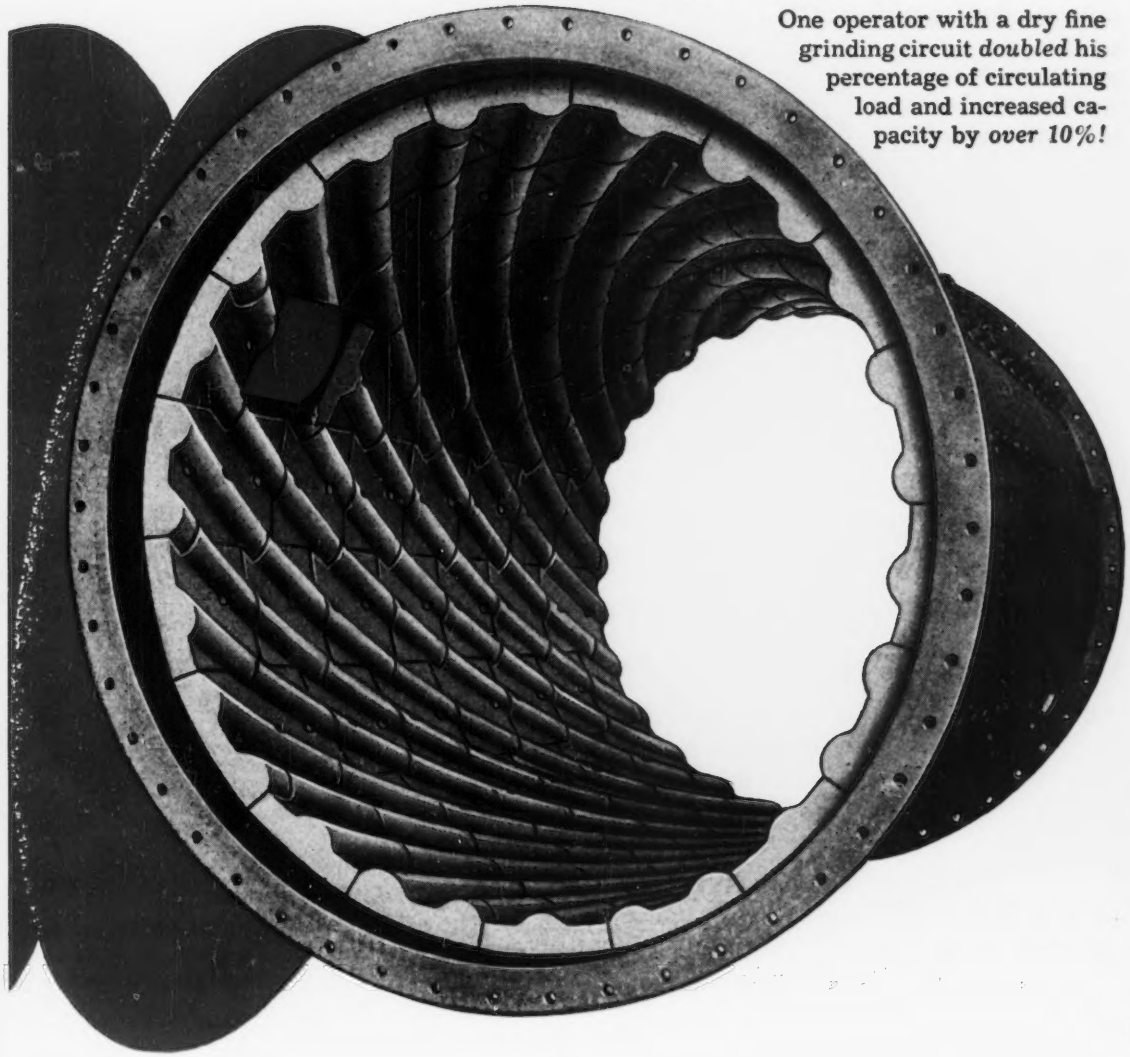
MILWAUKEE 1,

HERE ARE USER EXPERIENCES . .

One operator with mills in a coarse wet grinding circuit *tripled* his percentage of circulating load with spiral liners.

Another wet grinding mill operator *tripled* circulating load and increased capacity by nearly 10%! Plans at this plant call for spiral liners for all ball mills.

One operator with a dry fine grinding circuit *doubled* his percentage of circulating load and increased capacity by *over 10%!*



CHALMERS

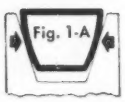
WISCONSIN

A-C ALLIS-CHALMERS

Why V-Belts with CONCAVE SIDES Last Longer!

(U.S. PAT. NO. 1813698)

Prove this yourself!

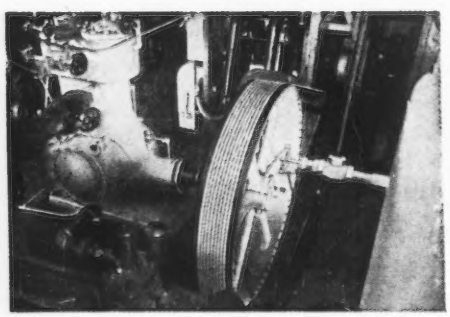


Take any *straight-sided* V-Belt (Fig. 1). Bend it—as it bends in going around a pulley. The sides will at once *bulge out* (Fig. 1-A). Clearly, those bulging sides will press *unevenly* against the V-pulley—and this causes *extra wear* at the points shown by the arrows (Fig. 1-A).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)

Instead of *bulging,* the precisely engineered CONCAVE SIDES merely *fill out* to *fit exactly* in the sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley. All wear is distributed *uniformly* across the *full width* of the Gates Vulco Rope—and this means *longer* belt life and *lower belt costs* for you!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE Sides—the Gates Vulco Rope!



Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear.

Gates VULCO ROPE DRIVES

REG. U. S. PAT. OFF.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

THE GATES RUBBER COMPANY

DENVER, U.S.A.

CB-541

LOOK . . . ALL THE BEST FEATURES

BUILT-IN FEED CONTROL *in backhead gives an infinitely variable range without step-by-step graduation.*

PUSH-BUTTON PRESSURE RELEASE *on control handle for quick retraction. Reduces pressure without re-setting feed control when drilling soft seams.*

BALANCED FORWARD PRESSURE *by attaching Air Leg at horizontal center line of drill. Minimizes misalignment of drill and steel, gives longer chuck life.*

LIGHTWEIGHT *and easily assembled, dismantled and moved around the mine.*

"WE OUTDRILL EVERYTHING WITH OUR JOY AIR LEG AND LM-47 DRILL . . ."

". . . Because the Controls Are On The Handle
We Can Beat Any Leg In the Mine—"

. . . SO REPORTS AN ENTHUSED MINER when asked about his Joy Air Leg used with the powerful Joy LM-47 Drill.

"IN LOOSE, BROKEN, OR FITCHERY GROUND you just can't top the Joy setup."

"FOR DRILLING LIFTERS" he continues, "we like the way the yoke fits into the machine. With no controls on the leg it's easy to drill off a drift round."

Try a Joy Air Leg and LM-47 Drill. You'll agree they are a perfectly matched pair and present something new in easy, efficient drilling and handling.

Write *TODAY* for details. • **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

W&D 4944

Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

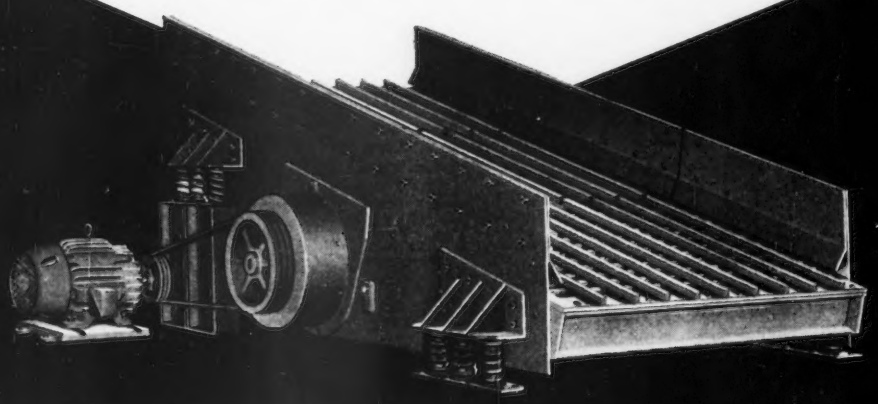
For the best in heavy-duty scalping you need every one of the BIG 4

1 GREAT STRENGTH Massive frame utilizes heavy-section ship channels and H-beam members. Welded deck is securely riveted to thick side plates. Stress-relieved construction easily withstands up to 40-in. boulders dropped from feeder.

2 HIGH CAPACITY Efficient vibrator mechanism permits screening extremely high capacities of sticky ore. Deck can be grizzly or perforated plate, furnished in welded carbon or cast abrasive-resistant steel.

3 EFFECTIVE SEPARATION All vibration is isolated from foundation by large, square-end helical springs and is concentrated in the live deck for thorough action of deepest bed.

4 TROUBLE-FREE OPERATION Automatic controls limit motion during acceleration and deceleration. Over-size, self-aligning roller bearings and hydraulic bearing removal device.



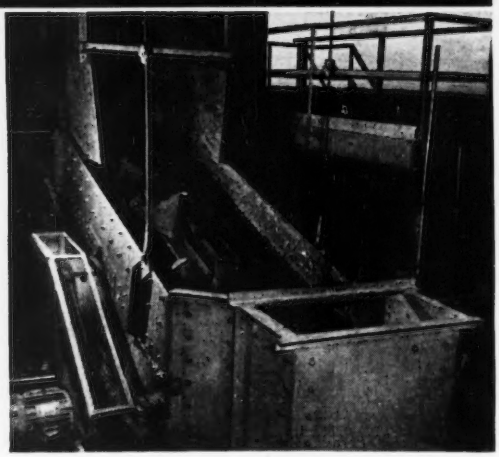
New LINK-BELT vibrating screen combines all the features essential to low-cost ore handling

LINK-BELT designed and built this heavy-duty scalping screen to the specifications of the men who will use it. Efficient sizing action has been combined with the ruggedness necessary for severe service to produce a screen of the caliber required to do your job.

This new screen can improve your operation by effectively keeping fines out of your primary crushing circuit without being a bottleneck. Ask your Link-Belt representative for all the facts or write for Folder 2461.

LINK-BELT

VIBRATING SCREENS



Link-Belt heavy-duty scalping screen provides high-capacity sizing at this Minnesota iron ore operation.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, Duluth 2, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 13 323

Products of fame

wherever there's flame...

Keeping flame on the job is the business of brick. Refractory brick to contain the flame and put it to work with efficiency and economy in the furnaces of industry.

Grefco refractory products have long been famed for doing this job reliably. Grefco brick, special shapes, mortars, plastics and castables to hold the heat and help spew out products for the service of industry.

If your operation requires *flame*, here's the name . . . *Grefco!*

A Complete Refractories Service . . .

GREFCO

GENERAL REFRACTORIES COMPANY
Philadelphia

GENERAL REFRACTORIES COMPANY

WALWORTH LUBRICATED PLUG VALVES

offer these advantages

- ...Direct port opening
- ...Quarter turn opens or closes valve
- ...Dead tight shut-off
- ...Freedom from attack by fluids being handled
- ...Pressure sealed
- ...Made in a complete line. Sizes from ½" to 30" for pressures from 175 to 5,000 psi., and for vacuum requirements

THESE are just a few of the reasons why Walworth Lubricated Plug Valves give "top" performance on many *difficult* services.

All Walworth Lubricated Plug Valves employ special insoluble lubricants which protect the plug and body against contact with the line fluid, thus combatting erosion and corrosion.

The lapped surfaces of the valve are "pressure sealed" when the valve is in either the open or closed position. By turning the lubricant screw, lubricant is forced under high pressure through a grooving system that completely encircles the ports as well as the top and bottom of the plug.

The lubricant seals the valve against leakage, and reduces friction between plug and body. This permits easy, quick, full-opening, or tight shut-off with only a quarter turn of the plug.

Number 1700 (illustrated) is a Steel-iron valve, wrench operated, designed for a working pressure of 200 pounds WOG (water, oil, or gas). Valves are available in either screwed or flange types. Screwed type have API line pipe thread lengths. Flanged type (No. 1700F) is faced and drilled to American Standard for 125-pound cast iron flanges unless otherwise specified.

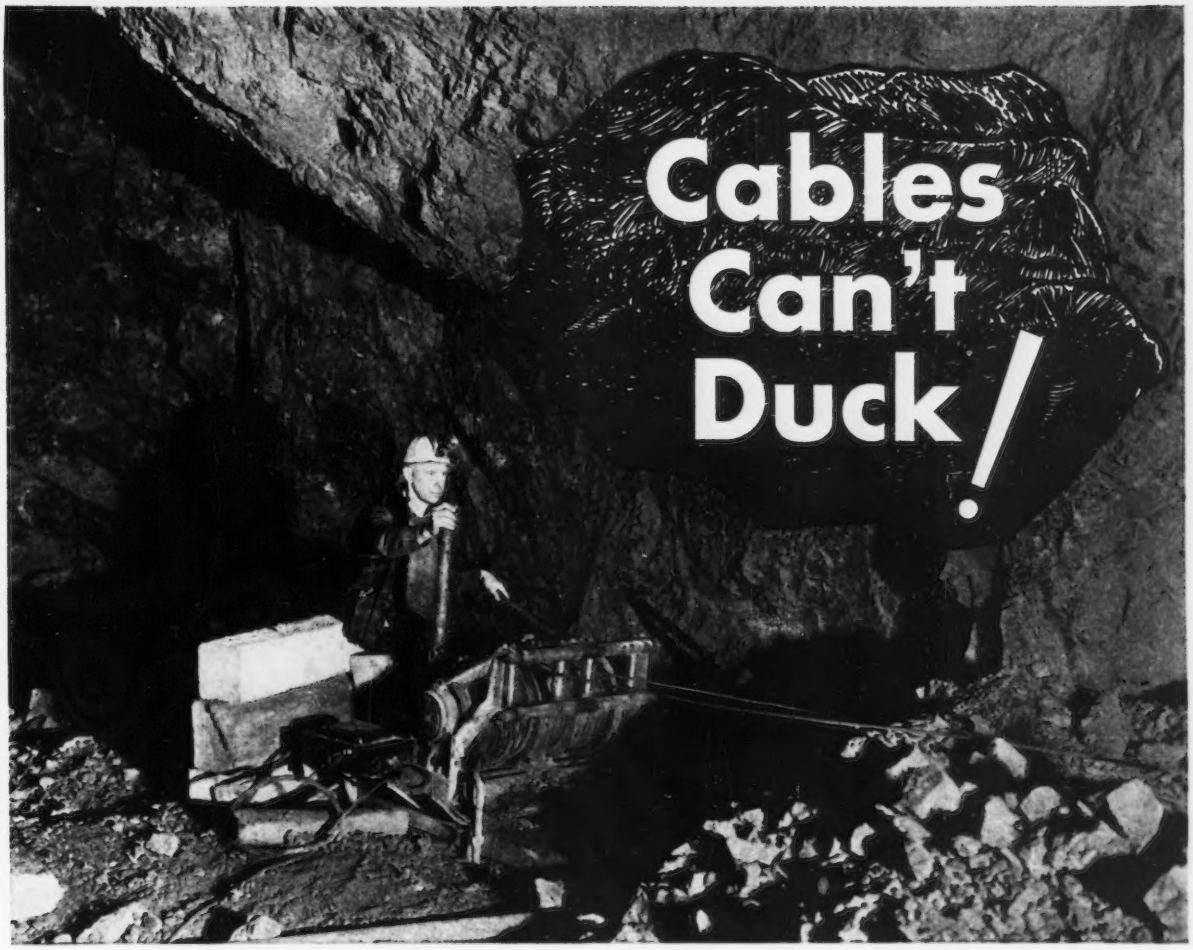
For further information about No. 1700 as well as the complete line of Walworth Lubricated Plug Valves, write for catalog.

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



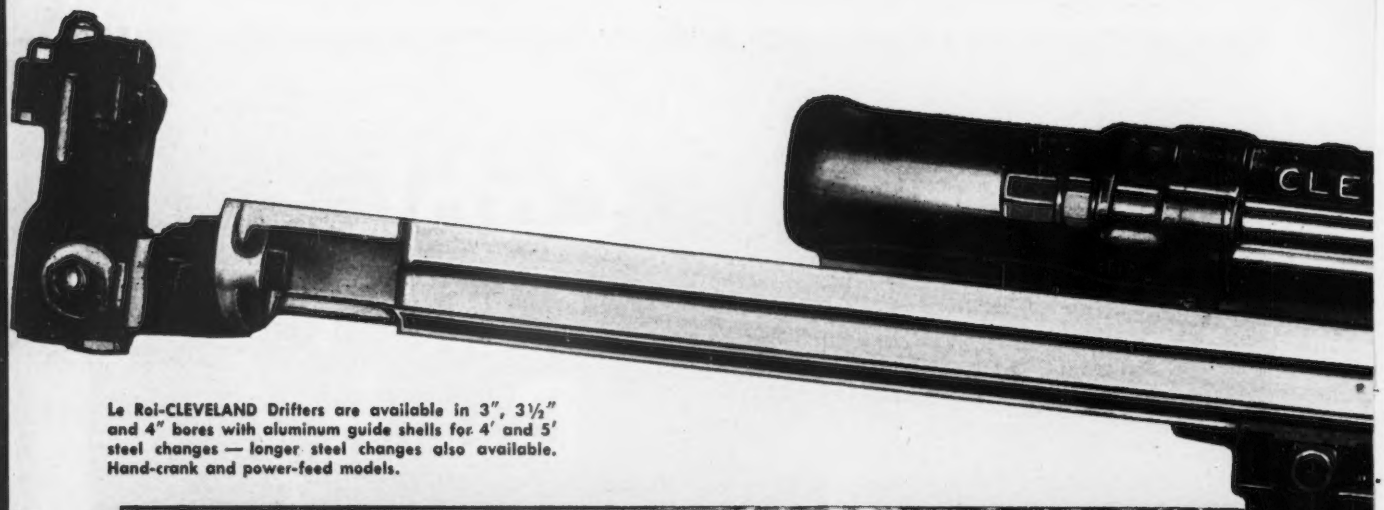
Portable cables for slusher hoists can't duck flying pieces of ore, spalling rock, water and mechanical abuse. They have got to stay put and take it. For these reasons you need more than a good power cable; you need the best that money can buy. Cables that can stand up under these tough operating conditions are the only kind that can help turn in a profit. The profit-making, loss-preventing kind is TIREX.

Simplex-TIREX power cables have a *tough, cured-in-lead, selenium-neoprene armor* to assure extra-long life. This special armor gives balanced resistance to abrasion, water, grease, oil and flame. It is this special balance of properties that makes TIREX Cables last longer and thus enables you to scrape more tons of ore.

Remember to specify and get Simplex-TIREX Cables for all your portable operations, including slusher hoists. These cables are marked "Simplex-TIREX" for your protection.

Simplex WIRES & CABLES

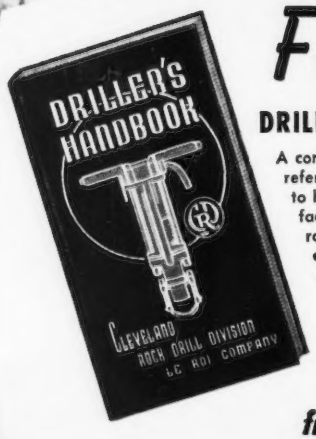
SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.



Le Roi-CLEVELAND Drifters are available in 3", 3½" and 4" bores with aluminum guide shells for 4' and 5' steel changes — longer steel changes also available. Hand-crank and power-feed models.

Le Roi-CLEVELAND Power Feed Drifters and Jumbo Booms.

Centralizer can be attached to any Le Roi-CLEVELAND Drifter. Directs the steel effectively, when collaring the hole. Easily cleared out of the way, either by hand or by the nose of the drifter, as the machine is fed forward.

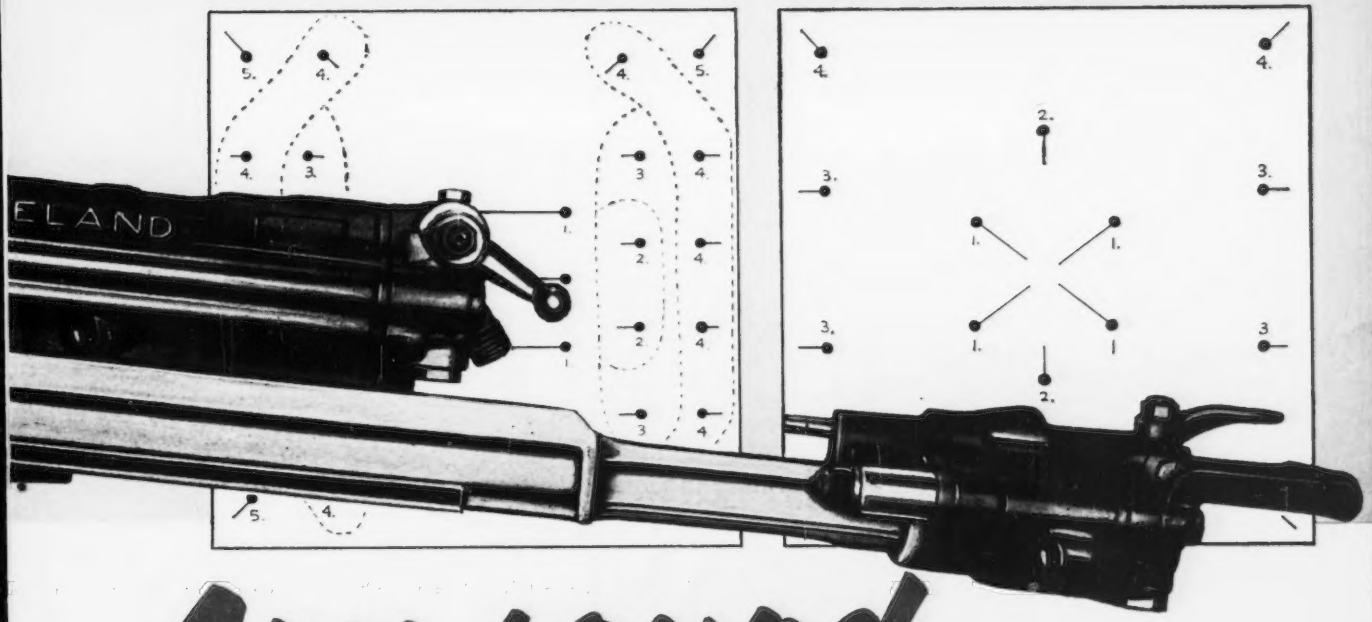


FREE!

DRILLER'S HANDBOOK

A completely revised, pocket-size reference book you won't want to be without. Gives you useful facts it pays to know about rock drills — lubrication, operating, maintenance, shanks and bits, compressed air lines, drilling and blasting, machine mountings, wet drilling, dry drilling, and other information..

Write for your free copy today!



Any round goes faster!

— with Le Roi-CLEVELAND Drifters and aluminum guide shells for 4′ or 5′ steel changes

No matter what pattern they use, your miners drill out the round faster with Le Roi-CLEVELAND Drifters.

It's easy to see why: Le Roi-CLEVELAND Drifters are easier to handle. And they have high drilling speed — plenty of rotation power — a wide selection of steel changes. In short, Le Roi-CLEVELAND Drifters have what it takes to drill more feet of hole per shift.

And — since they help raise your tonnages, they help cut your costs, too. That's because they use air economically — and because they're built "tough" to stay underground where they can do you the most good.

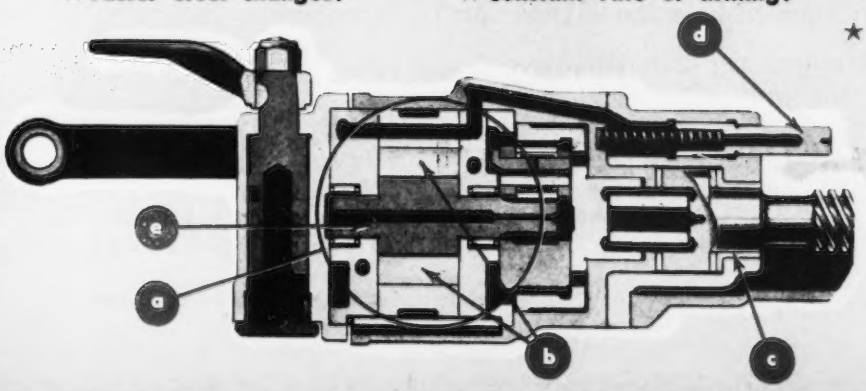
Yes, sir, Le Roi-CLEVELAND Drifters are "just what the doctor ordered," to speed up your drilling cycles, increase your footage, and lower your drilling costs. Ask your Le Roi representative for the whole story.

Write for free Bulletin No. RD25.

CLEVELAND ROCK DRILL DIVISION
Le Roi Company
A Subsidiary of Westinghouse Air Brake Company
12500 BEREA ROAD • CLEVELAND 11, OHIO • *Plants: Milwaukee, Cleveland and Greenwich, Ohio*

Advantages of Le Roi-CLEVELAND Power Feed

★ ***Faster steel changes!*** ★ ***Constant rate of drilling!*** ★ ***Reduced operator fatigue!*** ★ ***More footage per shift!***



a. Motor proper is vane-driven, double-lobe type. Power is applied at diametrically opposite points of rotor — for better feeding action, more constant torque.

b. Vane-type design provides fast, positive feeding — uses little air.

c. Floating-joint construction and thrust washers absorb shocks, reduce upkeep.

d. Exclusive automatic shut-off valve prevents drifter from hitting feed motor, when changing steels.

e. One-piece rotor is carried on roller bearings at both ends. The three intermediate gears also operate on roller bearings.

RD-56

Help for Mine Operators on the cost sheet... and on the job

In the past 15 to 20 years, the mining industry has kept stripping and output costs down in spite of rising labor and material costs. To do it, mine operators have pioneered new earth-moving techniques that have put constantly increasing demands on machinery. That's why in today's tough competitive era, mining requires modern, versatile equipment that enables the mine operator to increase output per man-hour and work at a profit.

In an effort to cooperate fully to meet these demands, Allis-Chalmers has for years geared its progress to that of the mine operator himself... now offers him completely new designs like the HD-15... a machine that takes advantage of even the most recent developments in tractor application.

The design of the HD-15 also makes full use of new metals, new oils and greases, and the latest manufacturing processes. Existing models were not allowed to restrict Allis-Chalmers engineers . . . so they worked right from the ground up, matching part to part, assembly to assembly, and the entire tractor to its Allied equipment. As a result, the HD-15 offers new standards in ease of operation and service, as well as long-life performance. With outstanding balance characteristics, it handles both mounted and drawn equipment well, provides maximum flexibility for the wide variety of jobs.

We invite you to talk with your nearby Allis-Chalmers dealer to compare values . . . see for yourself how the HD-15 can be a big factor in helping you to increase output per man and hold costs in line.

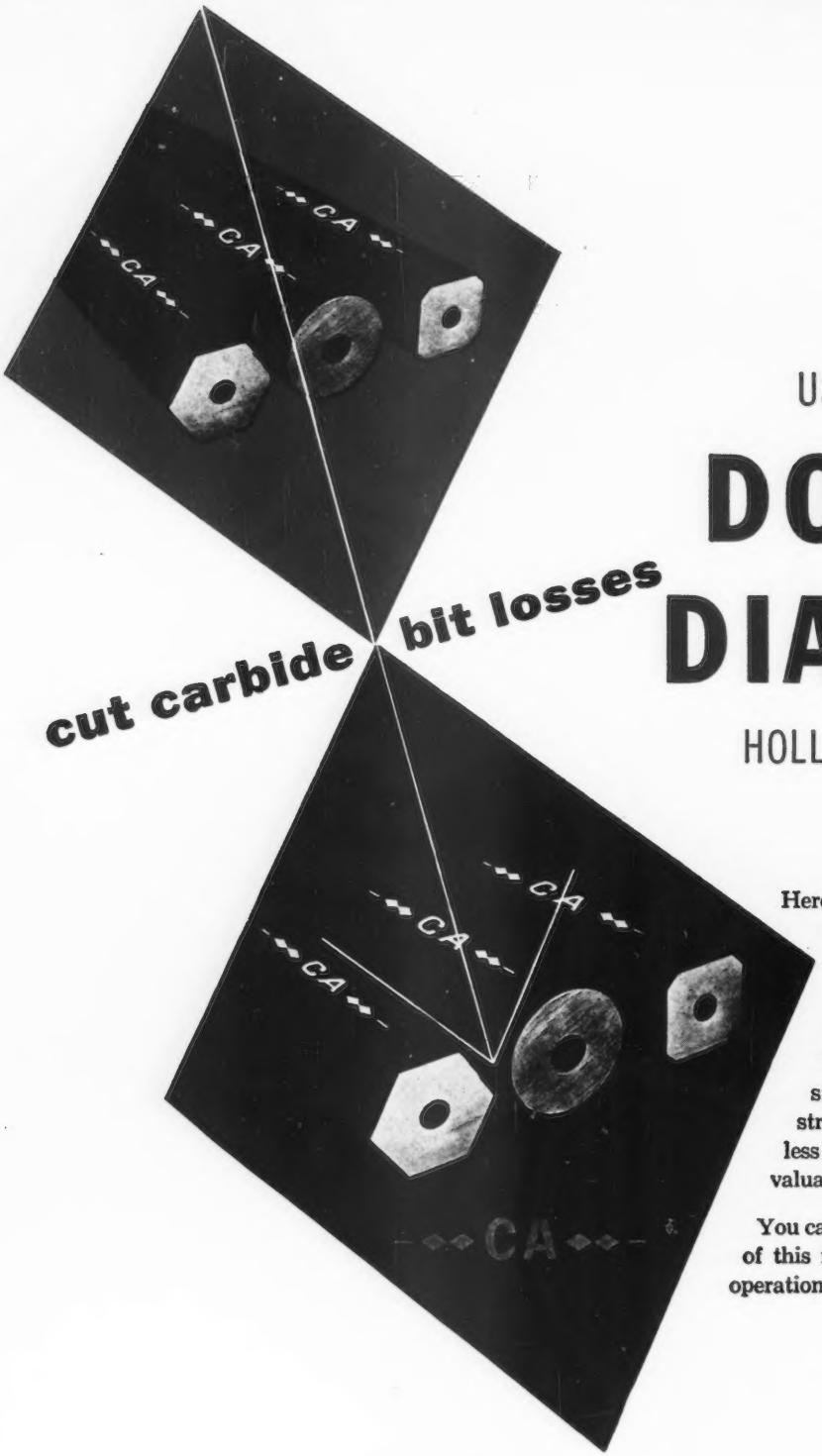
ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

HD-15
109 drawbar hp.
27,850 lb.
Six speeds forward to 5.8 mph.
Three reverse speeds to 4.5 mph.

Constant progress in earth-moving methods has been matched by such design advances as this HD-15 and its engine-mounted dozer . . . which were engineered and tested as a unit, right from the start.

This HD-15 Tractor Shovel is a tool which introduced a new era of tractor usefulness. This versatile machine moves from job to job easily and does traditional jobs in a better, faster way.

The improvements and refinements of really modern design take on new significance as demands on machinery grow. Extra yardage handled . . . or lubrication time saved means working more efficiently, more profitably.



cut carbide bit losses

USE CRUCIBLE

DOUBLE DIAMOND

HOLLOW DRILL RODS

Here's the finest, toughest hollow drill rod made. Crucible DOUBLE DIAMOND is made to tool steel specifications by the nation's leading producer of tool steels.

That's why it has greater fatigue strength . . . and greater fatigue strength means lower drilling costs — less down time and fewer losses of those valuable tungsten, carbide bits.

You can't afford to overlook the advantages of this fine alloy drill rod in your drilling operations. Write for full details.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

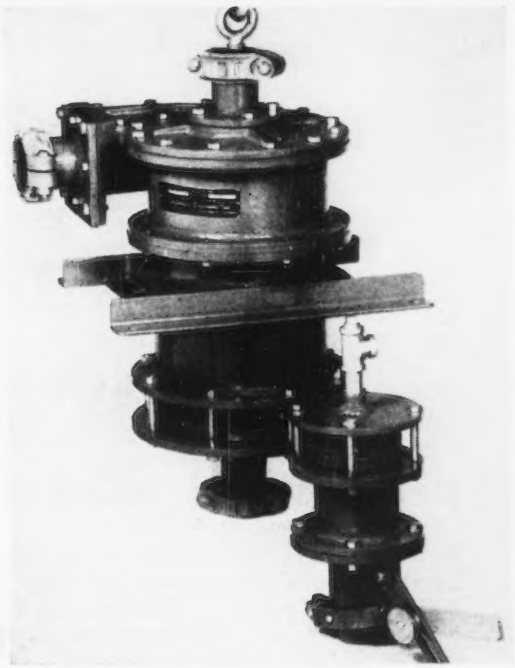
HOLLOW DRILL RODS

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

E&MJ NEW PRODUCTS DIGEST

FEATURE



Better classification,
Higher capacity,
Less wear,
are promised by . . .

New Cyclone Design

KELLOGG KREBS
Equipment Engineers Inc.
San Francisco, Calif.

BY TAKING FULLER advantage of the laws of fluid mechanics, a two stage cyclone unit, Model EE, developed by Equipment Engineers Inc., has demonstrated higher capacity, better classification and less wear in pilot plant test than previous models, using cylindrical instead of conical vessels. Unit is said to be capable of classifying coarser sizes than has hitherto been attempted in cyclones.

Before discussing the theory and practice of this unit it will be helpful to review some of the past work with wet cyclones.

In the mid-20's wet cyclones were used to degrit clays in the South. The low angular velocities due to low pressures and large diameters caused friction to fully dissipate the energy of the vortex near the apex of the cone and sands were continuously removed as from a Callow or Allen cone.

A few years later wet cyclones were used on a few oil well drilling rigs to supplement screens in removal of sands from drilling fluids but application was limited. Nevertheless, classification was good and the findings at that time would have been of much interest to mineral dressing engineers seeking similar low cost classification.

First cyclone that we know of in this country was the Samson cyclone 3 in. in diameter, using 40 to 50 psi, employed in 1939 to remove dirt from a liquid in proportions not unlike a dust collector.

Postwar dissemination of data on the DSM cyclone as used in the Netherlands as a separator for coal in a medium, was so effective that there was a great upsurge of investigation of liquid cyclones.

All the dynamic classifiers mentioned are designed with a cone. A slurry in a cone contains the coarser particles in the lower section. Because of high angular velocity wear is extremely severe where a projection of the overflow cylinder would meet the lower portion of the cone. All who have studied cyclones with abrasive particles find this characteristic, even though the energy has been considerably dissipated towards the apex by forced densification in a zone of high angular velocity.

A well-known physicist has stated

from the mines...

to every form of manufacture

View shows the MS "CITY OF QUITO", one of the many seagoing vessels dependably powered by NORDBERG DIESEL ENGINES.

ZINC

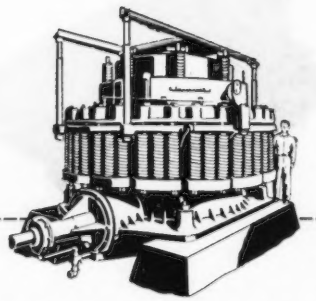
proves its usefulness to man...

Virtually unknown to ancient man, the constantly increasing use of zinc has played an important role in the development of modern civilization . . . on land, from pharmaceuticals to transportation equipment, on through the electrical and telephone industries . . . at sea, from navigational equipment to the many forms of corrosion protection necessary to guard vessels against the elements . . . and in thousands of other applications touching almost every conceivable industry and product, and making our lives better as a result.

In the production of zinc, *as in all of the great ore and industrial mineral operations the world over,* Symons® Cone Crushers have aided in civilization's requirements by making possible increased production to meet growing demands, and by reducing the cost of this production through more efficient crushing operations.

SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

NORDBERG MFG. CO., Milwaukee, Wisconsin



C553

SYMONS Cone Crushers . . . the machines that revolutionized crushing practice . . . are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to 900 tons per hour.

SYMONS GYRATORY CRUSHERS

GRINDING MILLS

MINE HOISTS

SYMONS VIBRATING BAR GRIZZLIES and SCREENS

DIESEL ENGINES

NORDBERG MACHINERY

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MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

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that human intuitions on rotation are unreliable. Perhaps the word cyclone instead of vortex implied a cone shape or certain apparent practicality made it a standard procedure. Helmholz, the originator of the mathematical theory of vortex motion, demonstrated several laws. "A fluid vortex is of constant strength through its entire length. It may only be terminated at a boundary. It consists of the same fluid particles as it moves through the fluid." The action of mineral particles in a densified slurry by conical confinement in a zone of high angular velocity, means friction expressed in heat and wear. This is a consumption of energy that appears to be subject to much better use by not designing a conical resistance to torque and the normal dynamic pattern of a fluid vortex.

Tramp Oversize

Another feature noted by liquid cyclone investigators is the tendency for tramp oversize to appear in overflows in small proportion but in scattered sizes, many meshes larger than the desired point of classification. With the strength of each orbit a constant, except for friction, it is surprising that the high angular velocity of a rotating bed of sand does not by turbulence pull more tramp into an overflow. An air core can also bring over small quantities of tramp oversize but here the shape factor is more pronounced and the spray discharge means lower density of underflow.

Herkenhoff has presented his findings with a 4-in. cyclone using only water at 15 psi. With a 1-in. overflow, the per cent of water to the underflow was zero at 7/16-in., 4% at 10/16-in. and 40% at 15/16-in. apex openings. This clearly illustrates the Helmholz laws of the constant strength of a fluid vortex. Only the dissipation of energy by friction from the viscosity of the water moving a longer angular distance, permits even 4% to report in the underflow when more than half the diameter of the overflow pipe.

A second but minor cause of tramp oversize appearing in the overflow is a short circuiting from the inlet to the vortex. Equipment Engineers, Inc. found this could be reduced by a parabolic shape from the edge of the vortex finder to a point inside of the inlet flow. Whether this inhibits a vertical vector as described by some investigators, or eddies, we do not know.

Table I—Recovery of Sands from Clay By Model EE Two-stage Cyclone

Size	Feed (% solids) 196 gpm (170 net)	Overflow (% solids) 160 gpm	Underflow (% solids) 10 gpm
	18.0	11.5	73.1
%+ 35	2.0		4.6
+ 48	2.3		5.3
+ 65	5.7		13.8
+100	15.7		38.8
+150	6.5		15.8
+200	5.0		11.9
+325	6.0	4.6	7.9
−325	56.8	95.4	1.9
Total	100.0	100.0	100.0

Rejection of −325 mesh slimes.....98.6%
Recovery of +325 mesh sands.....93.7%
Feed.....170 gpm+26 gpm recycled
Overflow.....160 gpm
Underflow.....10 gpm

A simpler device of using a long sweep to gradually increase the angular velocity, and have some orientation of particles outside the chamber and to avoid the instantaneous angular acceleration of a true tangent, seems to be equally effective. This stream flow application shows a reduced wear in a localized region by graduating angular acceleration.

A cylinder having the same residence time as a cone three times as long, means far less wall friction, less angular path of slurry, and a small fraction of energy dissipated by densification in the orbit of highest angular velocity. Besides the reduction of friction and wear, the conservation of energy to do further work has been mentioned.

On a slurry of 20% solids pumped in through a sweeping nozzle at 20 psi, the pressure into the auxiliary cleaner cyclone was 18 psi. The primary unit has been permitted to function according to the laws of a true vortex, so that classification efficiency is high in relation to power and capacity. The conserved energy not consumed by the frictional restraint of a cone is a force of real magnitude on a lesser volume because of the further increased angular velocity of the small cleaner cyclone.

The velocity pattern into the cleaner unit is not just a matter of pressure. With the sharp increase in angular velocity gradient of the smaller cylinder on a product relatively low in slimes, thickening and displacement of a maximum of residual slimes results. The overflow of the small unit will have some scattered top sizes but this flow is relatively small and invariably much more dilute than the primary cyclone feed. Normally to have optimum overall classification the small cyclone overflow should be recycled to the feed.

In the primary cylinder, with a fluid pattern of classification in vertical lattice planes, further increased capacity may be had for a given orbit of cut by using dual overflows. The increment is not a function of relative areas or even circumferences of the dual overflows compared to a single one, but with an equal set of operating conditions, at the same cut, dual overflows will add 20% or more to capacity.

Investigators have logically tried the displacement of slimes in the underflow liquid with fresh water. If done near the apex by injection, some added dilution of underflow results. Also to avoid a turbulence influencing the overflow sizes, water jetting requires a very nice synchronization with the strength of the vortex. Our studies on the point of addition conformed to the data presented by Dahlstrom that the water should be added at a height related to the gallons per minute of the overflow and underflow. Although it seems contrarywise we also found the pattern was influenced least and displacement most effective by immersing the apex in a launder of fresh water. This is seldom practical but has been in use by two operations for some time.

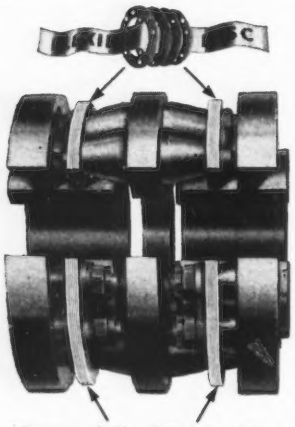
The best result is attained by two staging, as nothing so effectively displaces residual slime as repulping and a secondary treatment. The Model EE two stage cyclone is an integral unit, and permits a jetting when desired at a mid-point of the cleaner cyclone without upsetting the dynamic pattern of the primary cylinder.

An example of the efficiency of the Model EE two stage unit is as follows: The problem is to recover all sands from a high clay content slurry overflowing a screw classifier. Feed per unit is 170 gpm net (196 gross), 26 gpm being recycled. The inlet feed is at 20 psi (Table I).

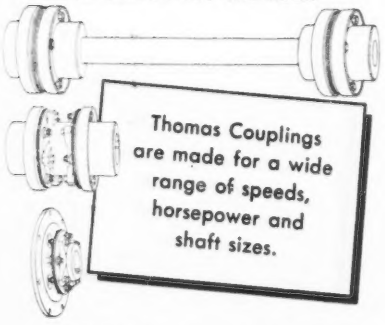
Three units handle slightly more than 500 gpm and are producing 11 tons per hour of these fine sands from the former waste product of the classifier overflow. (1)

Specify THOMAS ALL METAL FLEXIBLE COUPLINGS for Power Transmission to avoid Costly Shut-Downs

DISTINCTIVE ADVANTAGES	
FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

NO MAINTENANCE PROBLEMS

ALL PARTS ARE SOLIDLY BOLTED TOGETHER

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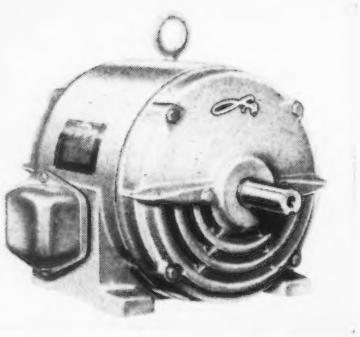
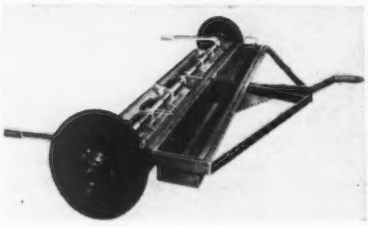
THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

E&MJ NEW PRODUCTS DIGEST



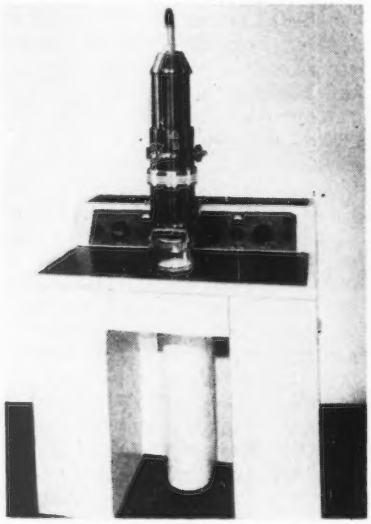
ELECTRIC MOTORS

New line of open drip-proof, totally-enclosed, fan-cooled motors in ratings up to 40 hp has been announced by Louis Allis Co., Milwaukee, Wisc. They conform to new NEMA frame size standards and feature improved ventilation, greater protection, new conduit box arrangement, new bearing construction and more versatile mounting. **(2)**



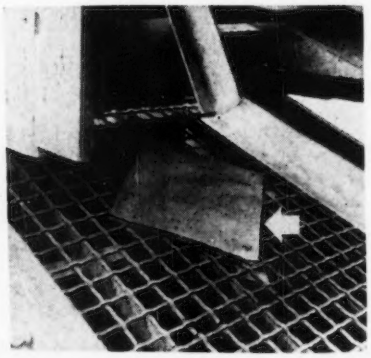
MAGNETIC ROAD SWEEPER

You can protect costly truck tires by using this magnetic road sweeper to pick up nails, wire and ferrous metal from your mine roads and open pits. Using Alnico magnets, sweepers are available in four sizes from 48 in. to 96 in. from Homer Mfg. Co., Inc., Lima, Ohio. **(3)**



ELECTRON MICROSCOPE

Suitable for analytical work in industrial processing and research, Model EM-75 electron microscope from North American Phillips Co., Inc., Mount Vernon, N. Y., uses an electron optical system that includes condenser, objective and projector lenses. Magnification is continuously adjustable between 1500 and 15,000 diameters and is variable between 10 and 75 kv. Resolving power is better than 100 angstroms under average operating conditions. **(4)**



PROTECTIVE SHEETING

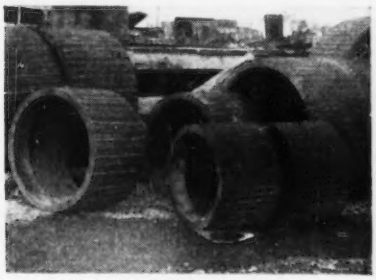
"Iron Rubber" is a protective sheeting for combatting abrasion and corrosion; to cut down wear on ball mills, ducts and pipes, skips, shaking tables, screens etc. Cut to any size or shape, both reinforced and non-reinforced types are available. Here it is used on a screen to protect that spot that receives greatest impact from falling rock. Circle No. 5 on the postage-free reply card opposite p. 42 to get more details from Magic Chemical Co., Brockton, Mass., the manufacturer. **(5)**

TRUCK FOR ROUGH TERRAIN

Model R-140-4x4 is one of two four-wheel-drive models introduced by International Harvester Co., Chicago, Ill., designed for use in rough terrain. This model, mounting a drilling unit above, has gross vehicle weight rating of 11,000 lb. in 130-in. or 142-in. wheelbase. Model R-160-4x4 has GVW rating of 16,000 lb in 154-in. and 172-in. wheelbase. **(6)**

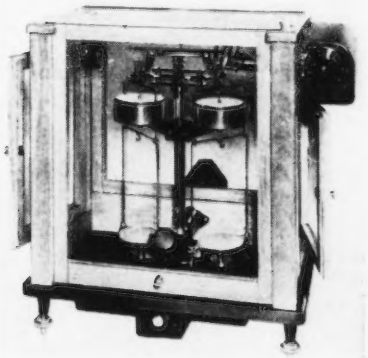
MAGNETOMETER

The Sharpe D1-M magnetometer, weighing 5 lb, is available from Radiac Co., Inc., New York, N. Y. Has maximum sensitivity of 70 gammas per scale division. On swing readings, normal sensitivity is 30 gammas per scale division. (7)



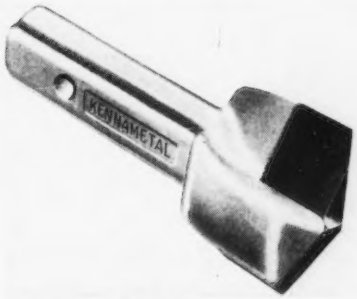
HARD-FACING ELECTRODE

An electrode particularly suited for hard-facing mining and crushing equipment has been introduced by Stoody Co., Whittier, Calif. With chromium and molybdenum as the principal alloys, this material is said to provide good resistance to all types of abrasion, to exhibit high compressive strength, and to have excellent impact resistance. (8)



PRECISION BALANCES

Precision balances for laboratory weighings where speed and accuracy are needed will be distributed in the U. S. by Burrell Corp., Pittsburgh, Pa. Made by Stanton Instruments Ltd., London, the line features damping cylinders for arresting the beam rapidly, and planes of synthetic sapphire to provide uniformly hard surface for maintaining sensitivity. (9)

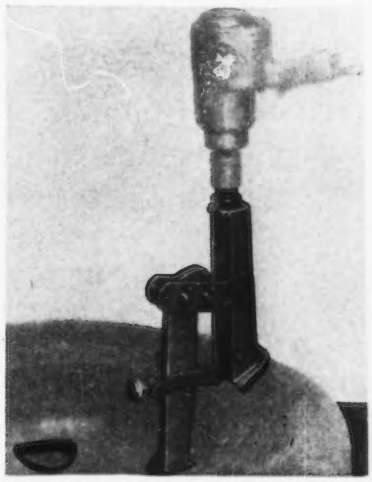


DRILLING BITS

Bits for more efficient drilling in the back have been announced by Kennametal, Inc., Bedford, Pa. The FDH design shown here is for harder rock. The FDL offers faster drilling in softer material. (10)

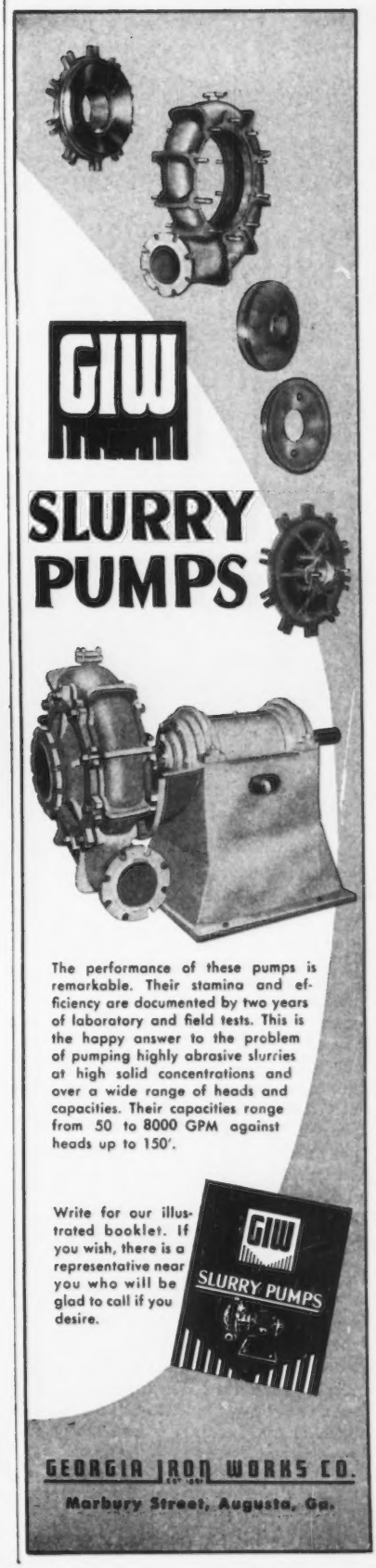
FREE WHEELING HUB

Four-wheel drive Willys vehicles can now be converted to two-wheel drive or back again, automatically or manually with hubs made by Warn Mfg. Co., Seattle, Wash. Saves gas, reduces wear on front axle, says the manufacturer. (11)



TRUCK TIRE REMOVER

Model 860-C "Universal" truck tire remover can remove tires from all


GIW
SLURRY PUMPS
The performance of these pumps is remarkable. Their stamina and efficiency are documented by two years of laboratory and field tests. This is the happy answer to the problem of pumping highly abrasive slurries at high solid concentrations and over a wide range of heads and capacities. Their capacities range from 50 to 8000 GPM against heads up to 150'.
Write for our illustrated booklet. If you wish, there is a representative near you who will be glad to call if you desire.
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SLURRY PUMPS
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The Engineer's Report

CASE HISTORY

PRODUCT *Chevron Starting Fluid*

FIRM *Young Truck Lines, Salt Lake City, Utah*

Starting fluid saves 1152 man-hours per winter!

A LITTLE CHEVRON STARTING FLUID, injected into the intake on the diesel engine of this truck, starts it instantly in temperatures far below zero. The fast starts eliminate delays that amounted to at least 16 hours per week on each of 6 trucks like this operated by Harry L. Young and Sons, Inc., Salt Lake City. Used for hauling mining machinery in the mountain states, these trucks often must be parked outside over night where it is extremely cold. Chevron Starting Fluid starts them anywhere they go without the aid of booster batteries. It is available in 1-pint cans, and in 7- and 17-cc capsules. In 9.9-cc pressure primer steel bulbs, ask for Chevron Priming Fuel. Your fluid supplier also has special primer equipment.

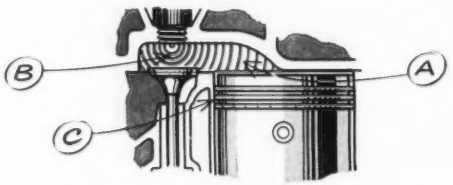
FREE FOLDER tells you more about Chevron Starting Fluid and where to apply it on different engines. Write or ask for it today.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

CHEVRON STARTING FLUID

TRADEMARK REG. U.S. PAT. OFF.

How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly



A. Atomizes in lowest temperatures and provides easily ignited vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—inhibits cylinder wear and ice formation in primer equipment.

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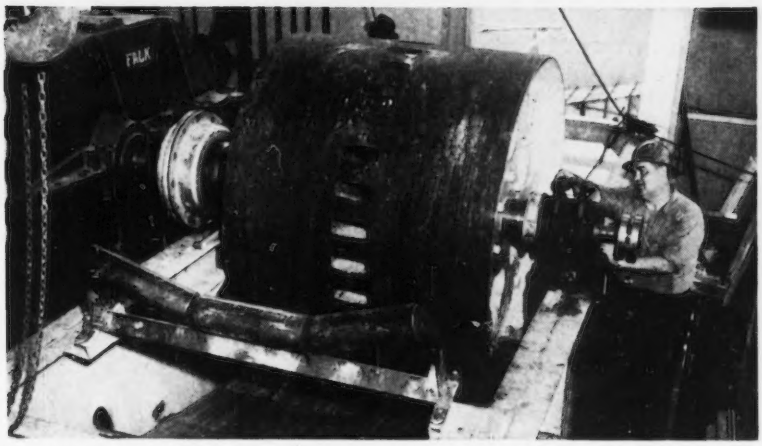
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

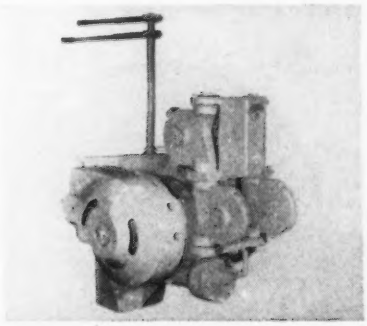


MAGNETIC PULLEY. What is believed to be the largest electro-magnetic pulley in the world, 60 in. in diameter with a 48-in. face, has been built by Stearns Magnetic, Inc., Milwaukee, Wisc. Improved lagging is claimed to have three times the traction of rubber lining but permits maximum use of the pulley's magnetic strength. (16)

rims or disc wheels in use on trucks today. Can also be used as a bead breaker on two-piece, semi-drop center rims. Bishman Mfg. Co., Osseo, Minn., has designed the tool for hand or impact wrench operation. (12)

AIR CONNECTION

Compact, quickly detachable air connection for air powered tools cuts pressure drop at connecting point to only 5% according to the manufacturer, Binks Mfg. Co., Chicago, Ill. They say pressure drop at most connections ranges from 21 to 57%. (13)



TRACTOR CONTROLS

Especially designed for use with tractors of 130 hp or more, an entirely new extra-heavy-duty cable control unit has been introduced by Woolridge Mfg. Co., Sunnyvale, Calif. Designated Model WD-2, it is said to employ a simplified power train comprised of only one worm gear and wheel. (14)

ELECTRIC MOTOR

"Tri-Clad" 55 is the new line of polyphase ac motors which are said to be 50% smaller and 40% lighter than previous "Tri-Clad" models. General Electric Co., Schenectady, N. Y., the manufacturer, also says they are better protected, quieter and more efficient. Shown here are the old and new. (15)

GAGE DIAL

Shop men from apprentice to master mechanic, should find Derck's gage dial helpful. The device has 13 complete, accurate, up-to-date tables covering answers to questions arising in

the core of the matter...

by
Frans Ls. Meyjes, C. E.

One of my associates on the New York Times in the course of conversation was saying just last week that in his opinion—and I value his word greatly – we haven't nearly exploited our total national mineral resources, in spite of what many so-called experts claim. He believes that in the next decade or so we shall see new fields opened up in a part of the country which is literally untouched – the East! In fact, he tells me, Westchester County, a very fashionable residential area, may one of these days be the scene of great mining activity.

★ ★ ★

We also heard recently that back in Colonial days the East was a prime producer of copper and silver for Mother England. Man by the name of Josiah Hornblower, about two hundred years ago, smuggled in a steam engine for the mechanization of a very prolific mine on the Passaic River near North Arlington.

★ ★ ★

Another gent, friend of ours, usually a pretty shrewd fellow, let it slip just the other day that he's buying up properties on Long Island. No, he's not interested in building row upon row of *ranch houses* or *split levels*. According to him —and this man is a hard-headed businessman— this is all by way of being an investment for his children, or his children's children. You see, he's sure these holdings will someday prove to be valuable mining properties.

★ ★ ★

Discovered the other day that the use of diamonds for drilling purposes has been known far longer than I thought. Seems that archeologists have found a crude ancient Egyptian diamond core bit for drilling rock that dates all the way back to about 3650 B.C.

Frans Meyjes, Vice President in charge of Production of ANTON Smit & Co., Inc., is also director of the Applications Engineering Division. The purpose of this division is to furnish free technical help to the mining industry on its specific diamond drilling problems. Call on your local ASCO Applications Engineer—or write the ASCO World Headquarters in New York—if you'd like to discover how to get . . . MORE FOOTAGE FOR YOUR DOLLAR!

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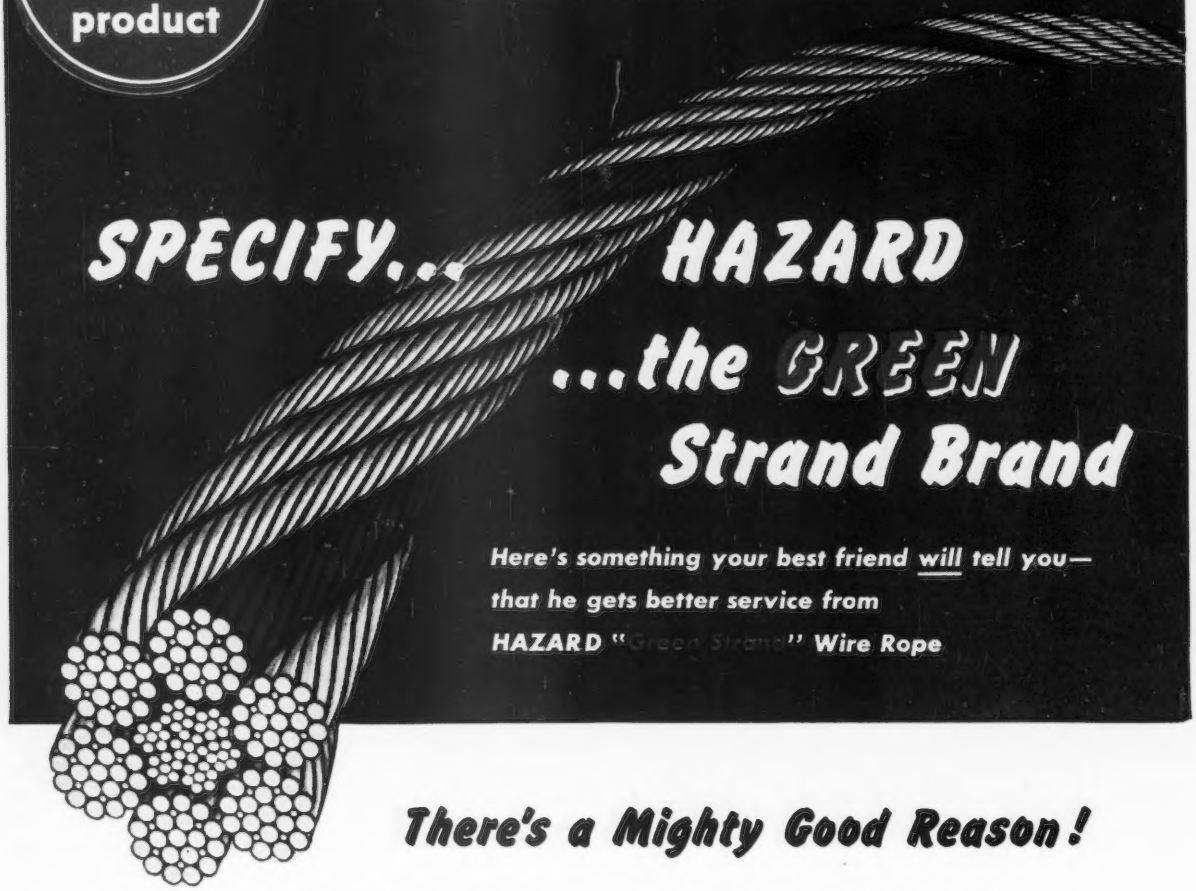
an ACCO product

LAY-SET Preformed WIRE ROPE



SPECIFY... HAZARD ...the GREEN Strand Brand

Here's something your best friend will tell you— that he gets better service from HAZARD "Green Strand" Wire Rope

There's a Mighty Good Reason!

● Sure, HAZARD is made to standard specifications but there is one thing that tells you the moment you look at it that it's the best wire rope made—and that's the GREEN STRAND.

It will cost you more in the long run if you just order wire rope—where you can get it the cheapest. Just like anything else, the experience and integrity of the manufacturer are the real reason why you get longer service and better value from HAZARD Green Strand.

HAZARD Green Strand is made from the best materials, with precision, by oldtimers in the wire rope business. Then only certain constructions, carefully checked in use, are recommended for specific jobs you do. It's this combination of quality wire rope and correct recommendations that saves you money on all your wire rope purchases.

● Don't just ask for wire rope—specify, *and get,* HAZARD Green Strand Preformed Wire Rope. See your local HAZARD distributor or write our Wilkes-Barre office today for recommendations covering the equipment you operate.

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ACCO

HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex.
Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Equipment Shorts

AUTOMATIC LUBRICATION. Nathan Mfg. Corp, New York, N. Y. has developed an automatic precision lubrication system called the Lo-Flo Lubricator capable of delivering minute quantities of lubricant to as many as 36 individual points, regardless of the difference in pressure required. It is available in 18 to 36-feed models, with or without group regulation of feeds. (38)

LPG FOR TRUCKS. The motor truck division of International Harvestor Co., Chicago, Ill., has placed in production five medium-duty models in the R-160 series with liquefied petroleum gas fuel systems, according to W. K. Perkins, manager of sales. International Harvester is the only truck manufacturer to offer Underwriters' Laboratories listed factory installed LPG fuel systems in this weight class. The new series ranges in gross vehicle weight from 14,000 to 17,000 pounds. (39)

COMPUTATION SERVICES. High-speed computation services, performed automatically on the Burroughs laboratory computer—Model I, are now available to business, manufacturing, trade and scientific organizations at the Philadelphia Research Center of Burroughs Corp. Developed and improved over the last two years for laboratory study, this electronic digital computer has been proven on a regular schedule of computations. Test problems for outside organizations have included turbo-engine design and performance calculations; pipe stresses for chemical processing plants; optical ray tracing; antenna calculations; and statistical correlations. (40)

SCREEN HEATING. A design improvement in Hanco electric screen heating equipment is announced by T. W. Hannon, general manager of F. R. Hannon & Sons. This consists of the use of a new type of glass insulation throughout the heater system which is reputed to greatly improve operating efficiency and extend heater life. (41)

LABORATORY FURNACES. Blue "M" Electric Co., Chicago, Ill. announces its newly redesigned series of electric utility laboratory gravity ovens for analytical laboratory and general laboratory work in the chemical and metallurgical field, involving baking, drying, preheating, conditioning and tempering. Operating temperatures range from 88 deg. C. to 288 deg. C. (100 deg. F. to 550 deg. F.) All units come complete, ready for instant use and plug in; 115 volts or 230 volts. (42)

RIMS. Continued exposure to weather takes heavy toll of trucks and trailers, and the rims of these vehicles, being nearest the ground, naturally are subjected to more abuse than most other components. For this reason, a protective coating has been developed to give added protection not only against weather, corrosion and the damaging effects of salt, but also against marring, discoloration and other adverse factors. Goodyear Tire & Rubber Co., Akron, O. (43)

TRANSFORMER. A completely enclosed, non-ventilated, dry-type distribution transformer for service on secondary circuits rated 600 v. and below has been developed by Westinghouse Electric Corp., Pittsburgh, Pa. Designated as Type E, the new transformer supersedes the type AJR line of dry type transformers. (44)

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

INSTRUMENT CONTROL. The 42-page Wheelco Data Book and Catalog (TC10) for those interested in solving process control problems covers a complete line of thermocouples, radiation detectors, and resistance bulbs are shown in the TC10. You will find it has a great deal of valuable information concerning various sensing units as well as tips on instrument servicing. (73)

CENTRIFUGAL PUMPS. Bulletin No. 237-C describes "Thrustfre" 2, 3 and 4-stage pumps for heads up to 650 psi. and with capacities of from 50 to 850 gpm. Available in both sleeve bearing and ball bearing designs for boiler feeding and general power plant and industrial use, these pumps achieve inherent dynamic, hydraulic balance by a patented method. Pennsylvania Pump & Compressor Co., Easton, Pa. (74)

EASY PLANT LAYOUT. Bulletin published by Peerless Photo Products, Inc., Shoreham, N. Y. tells how con-

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after March 1, 1954, if mailed in the U.S. or Canada.

Engineering and Mining Journal—January, 1954
NOT GOOD AFTER MARCH 1, 1954—if mailed in U. S. or Canada

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	22	29	36	43	50	57	64	71	78	85	92
2	9	16	23	30	37	44	51	58	65	72	79	86	93
3	10	17	24	31	38	45	52	59	66	73	80	87	94
4	11	18	25	32	39	46	53	60	67	74	81	88	95
5	12	19	26	33	40	47	54	61	68	75	82	89	96
6	13	20	27	34	41	48	55	62	69	76	83	90	97
7	14	21	28	35	42	49	56	63	70	77	84	91	98

My Name ..... Position .....

Company .....

Address .....

ventional plant layout procedures which entailed high cost and many man-hours of drafting are now replaced with a low-cost plant layout system involving the use of photocopy. By using this system, one large plant manufacturer completed a job involving over 2,000,000 sq. ft. floor area with a saving of 2,720 man-hours of drafting time. (75)

CYCLONES. Bulletin (2502) "The TM Dorr Clone" describes in detail the physical appearance, applications, advantages, and action of this multiple-unit type liquid cyclone as well as actual operating data obtained from initial tests and installations. Sectional elevation drawings and pictures of the individual components of the unit are also included. Dorr Co., Stamford, Conn. (76)

TRAVEL EXPENSE. If your job requires attending meetings and conventions, Trip-Charge Inc., Pittsburgh, Pa., offers a free booklet describing possible tax savings. Savings suggested cover expense items of every kind: Gratuities, gifts and other aspects of travel expense are described in the pamphlet. Even travel expenses on behalf of non-profit organizations can be deducted as a gift to that organization. (77)

DREDGING LADDERS. To thoroughly present the case of "Swintek" dredging ladders, a 16-page booklet, catalog 83, is just off the press. Sketches take the reader below the water line to show how the traveling chain and the suction line and how cutter bars on the traveling chain work. Dozens of on-the-job pictures show many types of suction dredges equipped with an Eagle "Swintek" ladder. Copies can be obtained from the Eagle Iron Works, Des Moines, Iowa. (78)

HOISTS. The "Pul-Lift," an unusual chain hoist design which either hoists or pulls, is illustrated and described in Bulletins P-260B and P-1260 of the Yale Materials Handling Division, Yale & Towne Manufacturing Co., Philadelphia, Pa. (79)

BUILDINGS. Complete information on standard steel or aluminum pre-engineered buildings is now available in a 24-page illustrated catalog issued by Soule Steel Co. (80)

VIBRATORS. Cleveland Vibrator Co., Cleveland, Ohio, published a 16-page illustrated catalog (109) describing their line of air vibration equipment, including metallic-impact types and air-cushioned vibrators which operate with a minimum of noise. (81)

CONVEYOR SCALE. For the continuous weighing of a steady flow of loose material on a conveyor belt, and the recording of the rate of flow, as well as the totalizing of the accumulated tonnage, the Trans Weight Belt-Meter uses an ElectroniK instrument as the recorded and totalizer. Unit is described in Instrumentation Data Sheet No. 10.18-3, from Minneapolis-Honeywell Regulator Co. (82)

CARSET JACKBIT BULLETIN. Bulletin (Form 4146) showing the complete range of Carset Jackbits for use with most of the popular threaded connections in use today, gives the user a selection guide for choosing the right Carset bit for each connection and application. Ingersoll-Rand Co., New York, N. Y. (83)

LUBRICATION. Bulletin 69-30 described a new chain oiling system which has been developed and released after extensive field tests and is available for immediate deliveries. Oil-Rite Corp., Manitowoc, Wis. (84)

ELEVATOR BUCKETS. Link-Belt Co. has just released a 12-page Book No. 2456 on its complete line of cast malleable and Promal elevator buckets, including Styles A, AA, AA-RB, B, C and Continuous, for handling such diverse materials as coal, coke, ores, grain, cement, chemicals, pulp, clay, sugar, salt, etc. (85)

ELECTRIC GENERATING PLANTS. D. W. Onan & Sons, Inc., Minneapolis has issued a "Blue Book" of general information concerning selection of engine driven electric generating plants. Described in simple, easy-to-understand language are the three general groups of electric plants: Alternating Current (ac), Direct Current (dc) and Battery Charging. Plant operation for each type is thoroughly discussed. (86)

EXHAUST PURIFIER. OCM Catalytic Exhaust, for removing carbon monoxide, fumes and odors from all types of gasoline-powered equipment, is illustrated and described in a 4-page folder from Oxy-Catalyst, Inc., Wayne, Pa. (87)

SLINGS. "Slings for Industry" is the title of Brochure No. 5308, offered by Macwhyte Co., Kenosha, Wisc. Slings having approximate breaking strengths of 1,000 lb. to 243.4 tons are listed, with safe loads for various angles of use. There is also other helpful information in this 4-page folder. (88)

RUBBER HOSE. "Tips on Hose Care" is an attractive 4-page bulletin full of useful hints for getting more life out of your rubber hose. Hewitt-Robins Inc., Buffalo, N. Y., is responsible for this excellent folder. (89)

TIRE RECAPPING. "How to Get More Recaps out of Your Truck Tires" is the title of an 8-page booklet from B. F. Goodrich Co., Akron, Ohio. Topics covered include inflation rules for greater mileage, correct loading, when to recap, proper patching of duals, good tire rotation practice, and driving rules for more tire mileage. (90)

CLASSIFIERS. Operating notes, calculations necessary in wet classification, and handy reference tables listing capacities and specifications are presented along with a description of the Wemco S-H classifiers in Bulletin Cl-S-2 available from Western Machinery Co., San Francisco, Calif. (91)

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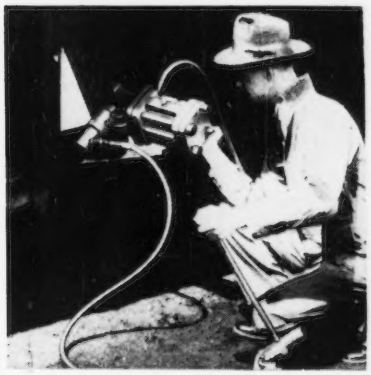
to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, on reverse side, tear out and mail.

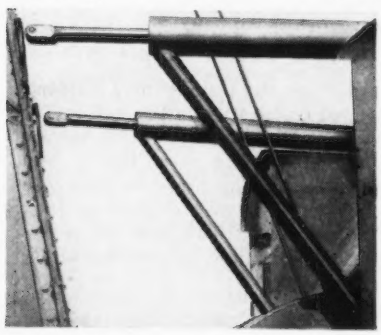
SPEED TALLY can check your entire inventory in a fraction of a second. These girls operate keyboard devices that feed information into the system, but the heart of the outfit lies in the 6-ft high cabinet in the rear. According to the manufacturer, Remington Rand Inc. (New York, N. Y.), the device, with some modifications, could be used to keep a perpetual inventory. (22)

the shop every day; such things as sizes of drills, machine screw data, tapers and angles, key sizes, decimal equivalents, etc. Pocket-size calculator is available from Goodmark, Inc., Dayton, Ohio, for one dollar. (17)



PORTABLE VIBRATOR

Compact and portable, Type HCRR air vibrator, made by Cleveland Vibrator Co., Cleveland, Ohio, will help you get those railroad cars unloaded in a hurry. (18)



BOOMSTOP

Two spring-loaded rams on "Rudo-Matic" Thomas boomstop provide a soft, cushioning effect when boom is raised too high. Ram pressure builds up from 250 psi to a maximum of 5,000 psi on Model 5000; and to 10,000 psi on Model 10000. McCaffrey-Ruddock Tagline Corp., Los Angeles, Calif. (19)

SUBMERSIBLE PUMP

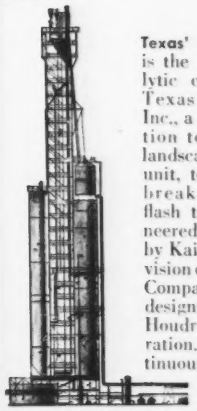
Automatic electric submersible sump pump with 1¼-in. discharge has a capacity of 2200 gph at a head of 10 ft. For portable or stationary service, it is only 12½ in. high, weighs 40 lb. Penberthy Injector Co., Detroit, Mich. (20)

POWER WHEELBARROW

New safety and performance features have been incorporated in the "Moto-Bug" power wheelbarrow. A dead man internal expanding brake system stops motion instantly when operator's foot is off treadle. Better transmission, easier part inspection, vertical clutch control and easier steering are also mentioned by the manufacturer, Kwik-Mix Co., Port Washington, Wisc. (21)

what's NEW in Engineering

An ingenious new alarm system which automatically sounds a warning when overloaded industrial equipment gets too hot, is said to be the answer to the problem of having to feel bearing cases and check thermometers scattered over a wide area. The moment a motor gets "too darn hot", a bulb lights up, and a central monitor gives out an audible alarm.



Texas' newest landmark is the Houdriflow catalytic cracking unit of Texas City Refining, Inc., a spectacular addition to the southwest landscape. The cracking unit, together with visbreaker and vacuum flash tower, were engineered and constructed by Kaiser Engineers Division of Henry J. Kaiser Company from the basic designs prepared by the Houdry Process Corporation. A new-type continuous bulk handling system for fresh catalyst and a new, centralized control system were also designed and built by Kaiser Engineers' process specialists.

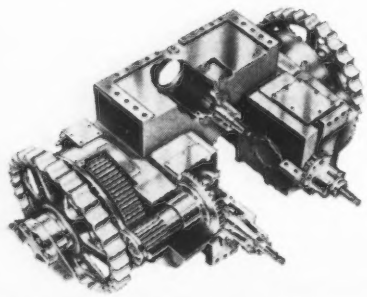
To be published January 1, 1954 by McGraw-Hill is the Third Edition of **Formulas for Stress and Strain** by Raymond J. Roark, Professor of Mechanics, University of Wisconsin. This thorough revision of a working handbook for engineers concerned with machine and structural design contains a summary of important formulas, facts and principles pertaining to strength of materials.

An indication of Kaiser Engineers' activity is the fact that more than 6,000,000 miles have been flown by key personnel, staying in touch with far-flung activities in widely diversified engineering fields. When you have a problem in design, engineering or construction, call or write: Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

THE EIMCO 105 FINAL DRIVE

Eimco's final drive assembly is just one of the new and exclusive features of the new Eimco 105. The Eimco final drive is a rugged heavy-duty assembly made of heavy alloy steel shafts and gears and encased in heavy alloy steel cast housings. The design permits easy access to gearing through side plates. The anti-friction bearings are assembled in cages for perfect fits and longer life.

Notice the absence of troublesome clutches, brakes and gadgets in this sturdy assembly.



Eimco 105 Tractor Excavator is a new heavy-duty machine, thoroughly tested in the field, with all desirable features for a modern prime mover.

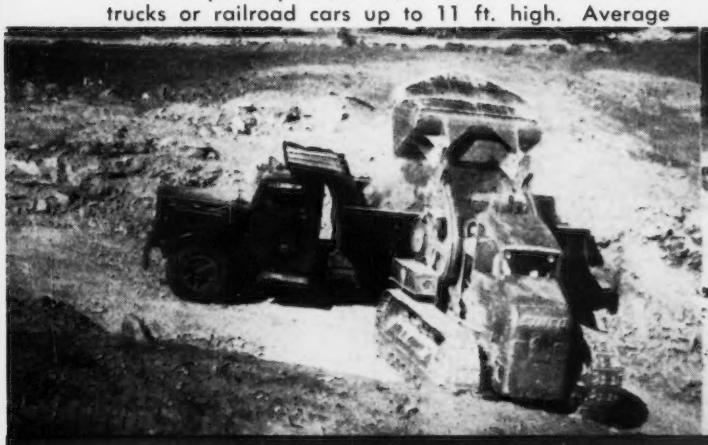
The 105 is a complete departure from ordinary tractor design in appearance and arrangement. The design features permit stronger construction, easier service when necessary and many other operating advantages such as:

1. Freedom from "leveritis" on the pulling and pushing of numerous hand levers, foot clutches, hand brake levers for steering and the necessity of stopping to change speeds or directions. With the 105 you use two small levers (one for each track) that can be held by one hand to give you forward motion — instant reverse or any degree of turn from "spin" turn to "feathered" turn. You can move the speed changing lever from one position to another while in motion under full load.

2. Full track oscillation even with attachments such as the Eimco loader.

3. Controlled loading speed through the Eimco two-speed bucket discharge mechanism. Easy light truck loading in low speed.

(Above right): Eimco 105 excavating material in pit with uneven bottom. This type of digging and loading is impossible with any other economical type equipment. (Above left): Fast moving 105 backs across to place bucket full of rock in truck which is parked on even spot in pit. (Below): The Eimco 105 can load trucks or railroad cars up to 11 ft. high. Average loading speed is 6 - 10 yards per minute in rock. Illustration on opposite page: The Eimco 105 shown here is loading a large truck from the end on a grade of approximately 20%. Two speed loading mechanism (exclusive on Eimcos) permits throwing load all the way back in this type of loading.



THE EIMCO CORPORATION

Salt Lake City, Utah, U.S.A.
Export: Clifton Sloan Bldg., 25 South St., New York City

B-3

4. Complete visibility with the operator well up front where he can see what's going on.

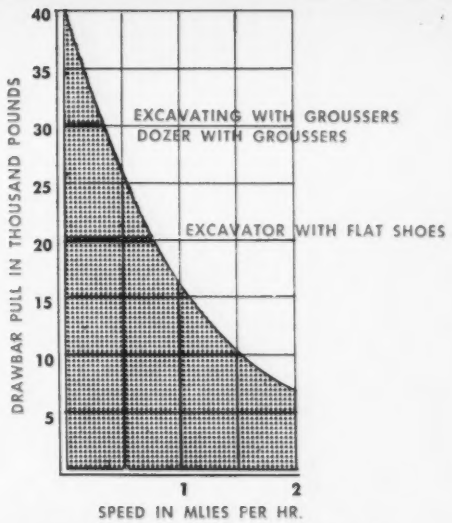
5. Greater production because of its easy handling and greater maneuverability.

6. Clutches never require adjustment.

Dependable operation is always a feature of Eimco equipment and in this the Eimco 105 is no exception. We have tried this machine under operating conditions where in a few short hours it has been subjected to more abuse than a high speed contractor can deal out in a month. The 105 can take it.

This rugged construction of the 105 was carefully planned. Every part has been designed for strength. Castings are all alloy steel. Wearing parts have been very carefully heat-treated. Machining tolerances have been held to rigid standards.

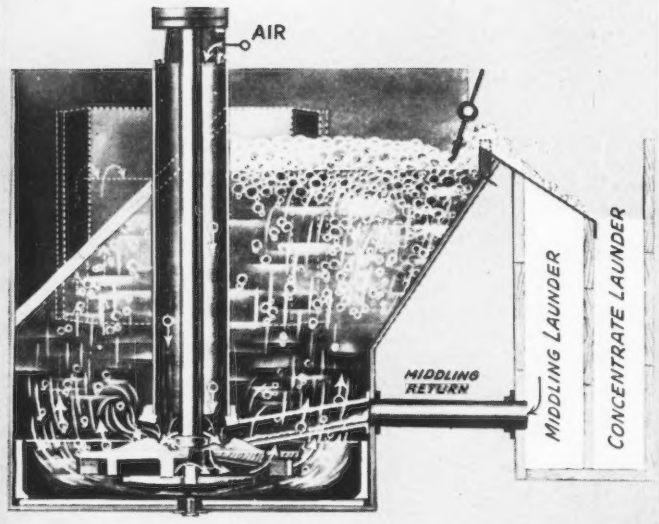
In addition to this, new designs have been incorporated in many of the individual pieces in order to give them greater strength, easier accessibility and in many cases to assure many years of operation with absolutely no attention except normal lubrication.



Drawbar pull charts based on preliminary tests showing relative comparisons.

DENVER "SUB-A" FLOTATION

Complete Milling Equipment – from testing, to feeder, to dryer!



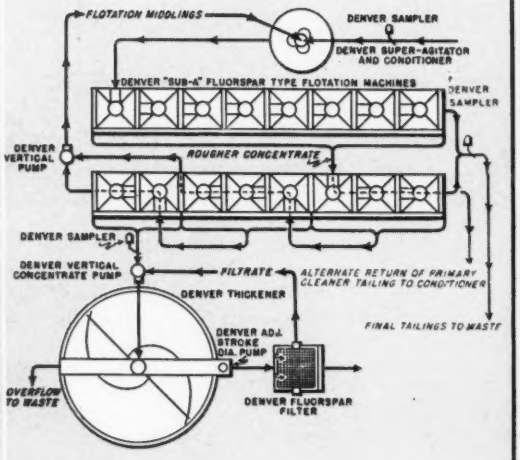


Photo at left shows cut-way view of Denver "Sub-A" Flotation Cell. Note how feed pipe enters at low level discharging on to impeller. Flowsheet at right illustrates flexibility in returning froth products for additional cleaning without use of pumps or step-downs. Note complete control of cleaner-cell tailings as they are recirculated.

Exclusive Principle of Denver "Sub-A" Flotation Permits Gravity Return of Middlings and Froth Without Pumps or Step-Downs

Clean, high grade concentrates and much lower costs are made possible by Denver "Sub-A" Flotation Machines. With cells all on one level, you can return concentrates to cleaner cells by **gravity flow,** and recirculate cleaner tailings. This completely eliminates expensive pumps and step-downs. Only Denver "Sub-A" Flotation offers these exclusive features. Positive recirculation — without "short circuiting" — gives you lower tailing and highest grade concentrates.

GRAVITY RETURN

The high original costs and maintenance of pumping or stepped down cells are unnecessary when you use Denver "Sub-A" Flotation. This is because the feed pipe is located near the bottom of each Cell—directly over the impeller. Since the location of this feed pipe is low, it is a simple matter to return middling froth by gravity down a launder into a cleaner cell six to eight cells away. The low level of the feed pipe also makes it possible to recirculate tailings from cell to cell— without pumps.

Thus, in Denver "Sub-A" Flotation Machines, cell-to-cell gravity flow and cell-to-cell middlings return is easy. You thereby eliminate pumps and step downs...and get better metallurgy...and have the flexibility you need to meet changing conditions.

HIGHER GRADE CONCENTRATES

Another important feature in all Denver "Sub-A" Machines which allows you to get higher values is the positive circulation feature. Positive circulation means that all material entering a Denver "Sub-A" Cell must enter through the feed pipe directly over the impeller. Thus any feed, middling return, froth return or coarse sand product gets maximum exposure to flotation treatment. As a result, Denver "Sub-A" Flotation gives you lower tailings and higher grade concentrate.

Write or wire—find out about the many other advantages of Denver "Sub-A" Flotation which help you get greatest profits with lowest costs.

Free Technical Bulletin Sent on Request

Over 25 years of Flotation Engineering

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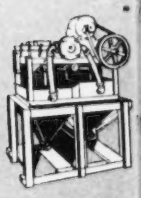
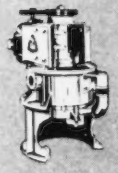
DENVER JAW CRUSHER

DENVER STEEL HEAD BALL MILL


DENVER MINERAL JIG

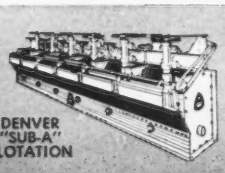

DENVER VERTICAL PUMP

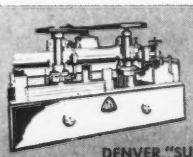
DENVER SRL PUMP

DENVER AUTOMATIC SAMPLER

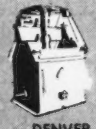
DENVER STEEL HEAD ROD MILL

DENVER ORE FEEDER


DENVER "SUB-A" FLOTATION


DENVER "SUB-A" SUPER ROUGHER FLOTATION MACHINE

DENVER SUPER AGITATOR AND CONDITIONER


DENVER "SUB-A" UNIT CELL

DENVER DIAPHRAGM PUMPS

DENVER DILLON SCREEN

B.F.Goodrich

Tires recapped 2 and 3 times after rugged construction-site service

THE Corvallis Sand & Gravel Company processes rock into ready-mixed concrete, concrete block, drainage tile and other building materials. This Oregon firm transports its products to construction sites, operates construction machinery on excavating, grading and bulldozing jobs.

Tires take a terrific beating. Tire costs can skyrocket. Yet Corvallis reports that even after this rugged work, its B. F. Goodrich Rock tires can be recapped two and three times!

One reason for such outstanding tire performance is the patented BFG nylon shock shield. Layers of strong, nylon cords under the tread of B. F. Goodrich off-the-road tires stretch together to protect the tire body from smashing road shocks. This nylon shock shield gives you a 4-way saving: (1) more original hours of service (2) more recappable tires and more hours of service per recap (3) increased bruise resistance (4) less danger of tread separation. You pay nothing extra for this exclusive B. F. Goodrich feature.

And BFG Rock tires (above) have a specially-compounded tread that defies rock cuts and snags. The non-directional tread grips in forward or reverse, resists slippage. You lose no time rescuing bogged-down equipment.

B. F. Goodrich off-the-road tires give longer service at lower cost. See the complete line at your BFG retailer's. The address is listed under Tires in the Yellow Pages of your phone book. *The B. F. Goodrich Company, Tire and Equipment Division, Akron 18, Ohio.*

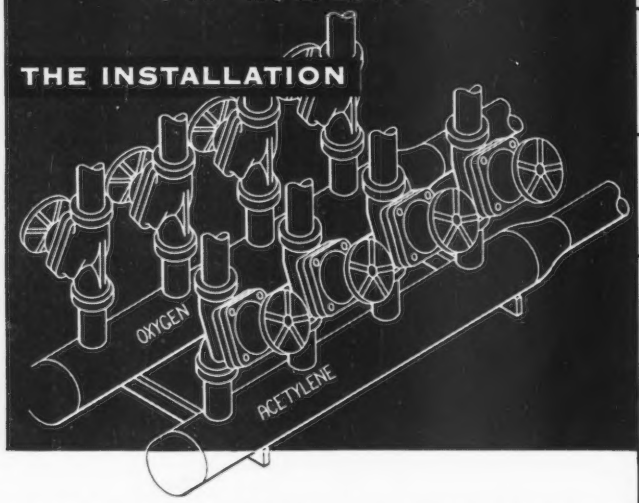
RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

Specify B. F. Goodrich tires when ordering new equipment

This Valve Stops Hidden Losses

...in Welding Gas Systems, for instance

THE INSTALLATION



In a prominent New Orleans shipyard, with Crane Diaphragm valves listed as "standard operating procedure" for complete oxygen-acetylene system. Shown is typical installation on portable manifold.

VALVE SERVICE RATINGS

SUITABILITY:	100% effective – no leakage
FEATURES:	No seating stress on diaphragm
MAINTENANCE COST:	Zero
SERVICE LIFE:	Installed 2 yrs. – long life indicated
OPERATING RESULT:	Big savings on welding gas costs
AVAILABILITY:	Crane Catalog item – No. 1652

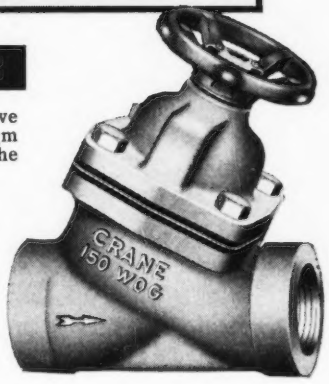
THE CASE HISTORY

Costly loss of welding gases was traced to the conventional packed valves formerly used on the system. Leakage through the stuffing persisted despite frequent, regular servicing of stem packing on the valves. This high maintenance cost added to the yard's loss.

The remedy was found in Crane No. 1652 packless Diaphragm Valves, Underwriters approved for the service. These valves stopped the leakage, and not one Crane valve has needed attention since installed more than 2 years ago. Despite continued expansion, the yard's costs for welding gas have been sharply reduced.

THE VALVE

The modern packless valve with Neoprene diaphragm that serves only to seal the bonnet. Its independent disc saves diaphragm wear, provides positive seating on fluid, even should the diaphragm fail. Choose from a wide range of body and trim materials for all kinds of corrosive and ordinary services. Sizes ½ to 6 in.; screwed or flanged ends. See your Crane Catalog, or your Crane Representative.



THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

"Save money? Sure!"

THAT, in a nutshell, tells you why so many wire rope users in the mines prefer Roebling wire rope... it speeds up operations... lasts longer on the job ...saves money that really adds up.

For the last word in wire rope efficiency and economy, call your nearest Roebling office or distributor for a Roebling recommendation.

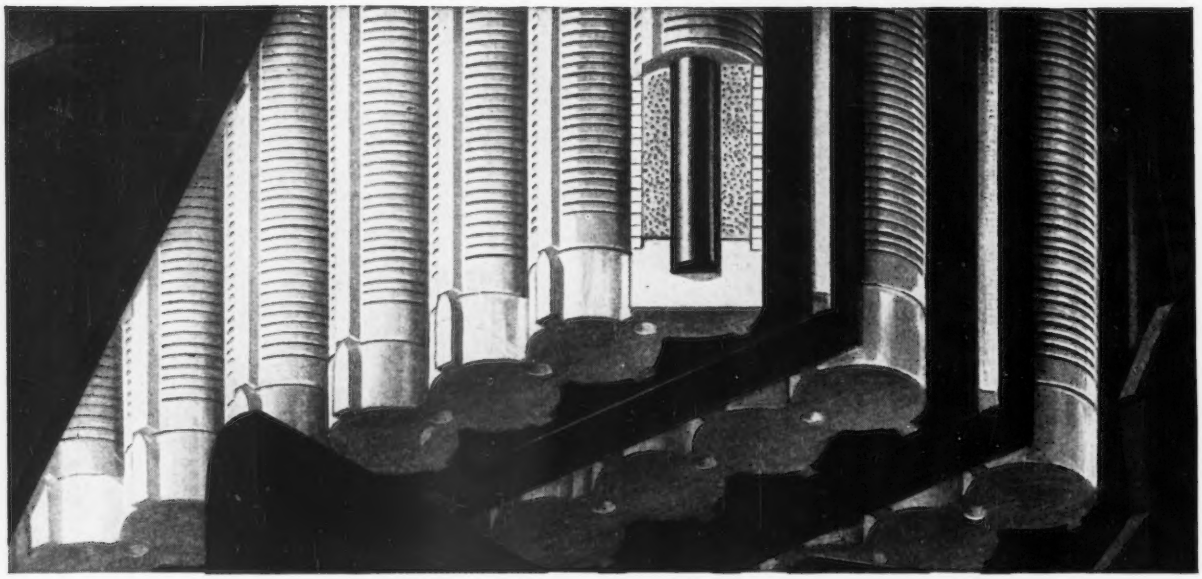
ROEBLING
A subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

For Mine haulage . . . Exide-Ironclad now offers

★ 20% more capacity in the same space

★ Lowest cost per A.H. to own and operate



This cutaway picture shows the inside of the new T H EXIDE-IRONCLAD Battery.

Its larger positive plates, containing corrosion-resistant Silvium, are different . . . unique . . . exclusive! No other type of positive plate construction offers you the advantages of the T H Exide-Ironclad, with its slotted plastic tubes, permanently sealed on the bottom with polyethylene tube sealer. More active material is exposed to the electrolyte, resulting in greater power. More active material is retained, providing higher battery capacity for a longer working life. Other features include improved negative plates... practically indestructible Pormax separators . . . new sealing compound . . . shockproof molded jar . . . unbreakable quarter-turn vent plugs of plastic . . . corrosion-resistant tray coating.

All of the features of the new T H Exide-Ironclad Battery construction provide direct operating-hour savings for you.

Now-more than ever before...
YOUR BEST POWER BUY AT ANY PRICE!

1888... DEPENDABLE BATTERIES FOR 66 YEARS... 1954

The new T H Exide-Ironclad BATTERY

Thrifty Hauler

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 2 • *Exide Batteries of Canada, Limited, Toronto*

"EXIDE", "EXIDE-IRONCLAD", "SILVIUM", "PORMAX", *Reg. T.M. U.S. Pat Off.*

Peruvian Iron Ore for the Mills of Birmingham

S-A CARRIERS handle the load— 2000 tons per hour, at low cost per ton

In 8 hours or less this ship will be loaded and on its way to sea, carrying Peruvian iron ore bound for the mills of Birmingham or Pennsylvania.

The efficient conveying and handling system that maintains this schedule day after day is equipped throughout with S-A "Simplex", 220 Series Carriers.

"Simplex" Carriers were chosen for their extremely long life and trouble-free operation in rugged service under exposure to dust and weather . . . doubly important in an installation thousands of miles from home!

Extra-strong spun-end roller construction that eliminates welded end plates and easy lubrication from one or both sides are just two of the many features that make S-A "Simplex" Carriers outstanding for low-cost operation on tough jobs.

In the *complete* S-A line, there's a carrier to help you move material at lowest cost, whatever the tonnage, size of belt or material handled. An S-A engineer will be glad to show you which is best for *you*—and why. Or write for our Catalog 2-C.

S-A "220-Series" Simplex Carrier with spun end interchangeable rolls. Roller bearings and die cast labyrinth seals insure long trouble-free life under roughest operating conditions.

MARCONA MINING COMPANY
(Subsidiary of Utah Construction Co.)
San Juan Bay, Peru

This complete conveying and handling system, largely S-A equipped, includes conveyors, trippers, screens and scalpers. Ore is carried to stock piles at the dock by 42′ belt conveyors and distributed by special trippers. A tunnel conveyor reclaims the ore and brings it by 1000′ x 60″ belt conveyor to a traveling loading tower having a capacity of 2000 tons per hour. Here a 36″ x 65′ belt conveyor on a swivel boom loads the ships of the 30-vessel fleet.

SINCE 1901 S-A STEPHENS-ADAMSON MFG. CO.

STEPHENS-ADAMSON MFG. CO.

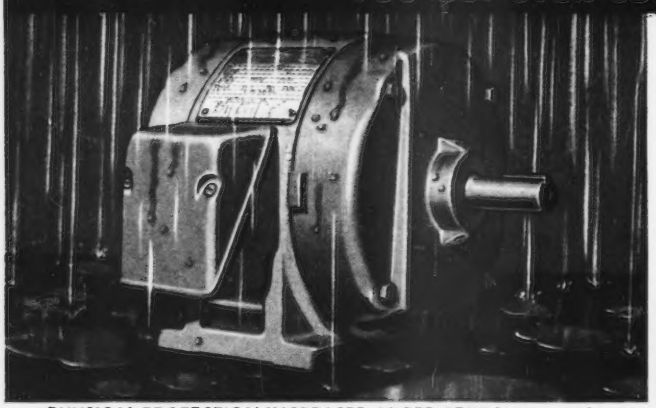
4 Ridgeway Avenue, Aurora, Ill. — Los Angeles, Calif. — Belleville, Ontario

Engineering Division
Specialists in the design and manufacture of all types of bulk materials conveying systems.

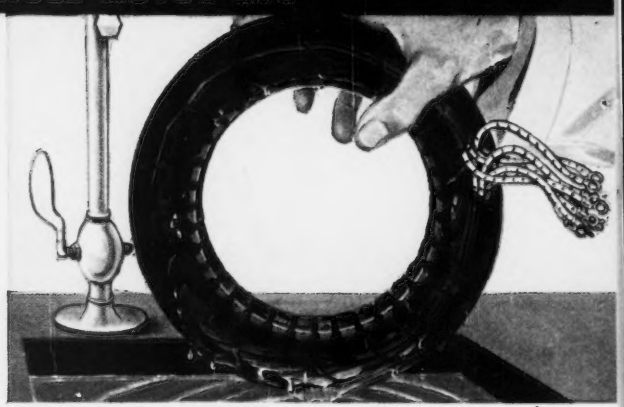
Standard Products Division
A complete line of conveyor accessories including centrifugal loaders—car pullers—bin level controls—etc.

Sealmaster Division
A complete line of industrial ball bearing units available in both standard and special housings.

YOU GET EVEN LONGER MOTOR LIFE



PHYSICAL PROTECTION INCREASED 60 PER-CENT by a complete redesign of cast-iron frame and end shields. This motor is suitable for many jobs where ordinary dripproof motors should not be applied.



EXTRA ELECTRICAL STRENGTH is assured by use of new polyester film insulation. A silicone coating, Dri-film,* virtually eliminates stator insulation failure caused by moisture.

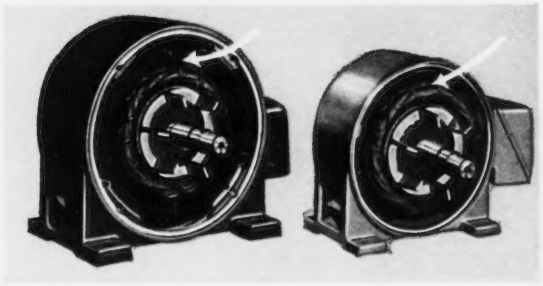
*REG. U.S. PAT. OFF.

TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

GENERAL ELECTRIC ANNOUNCES...

THE ALL-NEW TRI 55 CLAD MOTOR

REG. U.S. PAT. OFF.



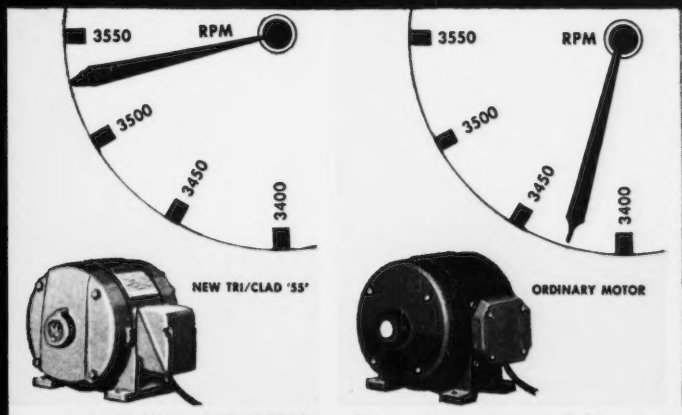
LIGHTER, SMALLER Tri/Clad '55' motors have been made possible through better use of space within the frame. Active materials (magnetic steel, copper) have not been sacrificed.

Complete Line of Dripproof, Enclosed Motors and Gear-Motors Available in Most Ratings in 1954

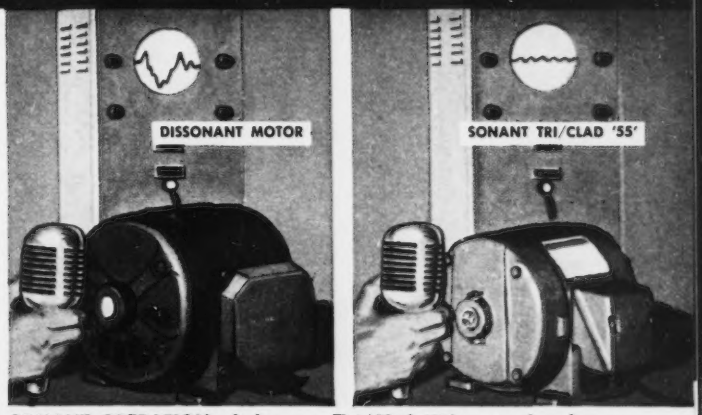
Here's the all-new Tri/Clad '55' motor — now available in NEMA 182 and 184 frame sizes.

You can get complete information on this dramatic motor achievement by writing for bulletin GEA-6013 on Tri/Clad '55' Dripproof motors, GEA-6012 on Tri/Clad '55' Enclosed motors, or GEA-6027 on Tri/Clad '55' Gear-motors, or by contacting your nearby G-E Apparatus Sales Office or G-E Motor Agent. General Electric Company, Section 648-1, Schenectady 5, N. Y.

YOU GET EVEN BETTER PERFORMANCE



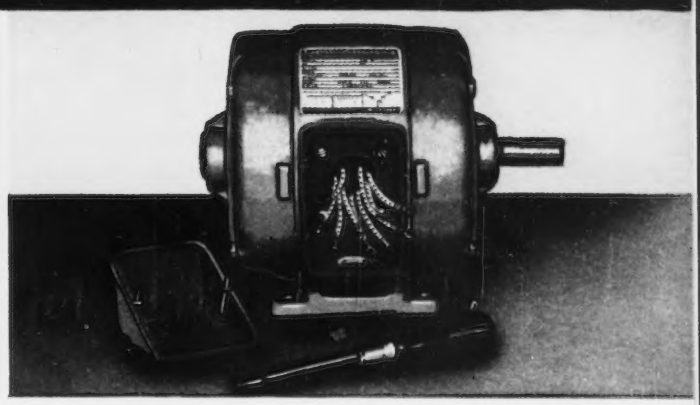
HIGHER FULL-LOAD SPEEDS is only one of many improved characteristics of this new G.E. motor. Above shows comparison of an ordinary motor with the Tri/Clad '55' — both rated at 3600 rpm.



SONANT OPERATION of the new Tri/Clad '55' motor has been laboratory tested and proven. Motor operates at reduced noise level, and operating sound is pitched to a more pleasant frequency.

YOU GET EVEN MORE INSTALLATION AND MAINTENANCE SAVINGS

NEW BEARING SYSTEM allows this motor to run longer than other motors without regreasing. One reason—greatly improved synthesized grease with 8 times the mechanical stability of ordinary grease.



EASIER TO SERVICE, the new Tri/Clad '55' has larger conduit box diagonally split for simplified wiring. Perma-numbered leads mean that even clipped and stripped wires are instantly identified.

Progress is our most important product

GENERAL ELECTRIC

Ingenuity Overcomes Tough Conditions at Box Canyon Dam Site

The designers of the new Box Canyon Dam in northeastern Washington chose a site on the Pend Oreille River which offered several advantages, but also a serious difficulty. The advantages: minimum clearing of the reservoir, no costly land acquisition rights, no relocations of highway, railroad or transmission lines. The difficulty: a deep scour pocket in the river bed extending through all alternative spillway locations.

The design they developed was ingenious. It consisted of a spillway dam of transverse-arch construction, with the arch resting on an impervious earthfill over the sand pocket, sealed with a 3-in. blanket of concrete. The dam will be anchored to the solid rock abutments of the canyon walls.

Scheduled for completion early in 1955, the dam, a gated structure, will be 260 ft long, 110 ft high from the center of the arch, 80 ft thick at the base, and 43.8 ft wide at the roadway crest. The water it impounds will drive four generators, with a total capacity of 66,000 kw.

In drilling through limestone for the primary diversion tunnel, forebay channel and powerhouse site, access road, and various other drillings, Bethlehem Hollow Drill Steel is being used in major quantities. And—as on so many other tough drilling jobs—giving a bang-up performance!

Wagon drill crews punch into the limestone formation in the forebay channel section of the powerhouse. Six-foot sectional Bethlehem Hollow Drill Steel was used in drilling blast holes averaging 25 ft deep, with some as deep as 60 ft.

Looking up-river at the Box Canyon Dam site. East abutment will be under the railroad bridge on left bank. At right will be the powerhouse and forebay channel, as well as the discharge end of a 220-ft diversion tunnel. Right: Jackhammer men peel a limestone cliff for the powerhouse.

Supervisory Authority for the Box Canyon Dam: Public Utility District No. 1 of Pend Oreille County, Washington. *General contractor:* Pacific-General-Shea, San Francisco. *Sub-contractors (drilling):* Diamond Drill Contracting Co., Spokane; Gibson & Roberts, Spokane; J. N. Pitcher Co., San Francisco; Drill steel supplied by Bitco, Spokane.

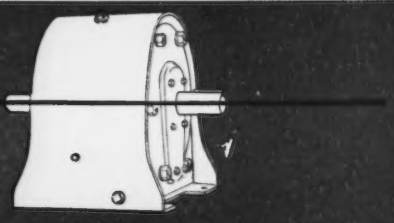
★ BETHLEHEM STEEL ★

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL

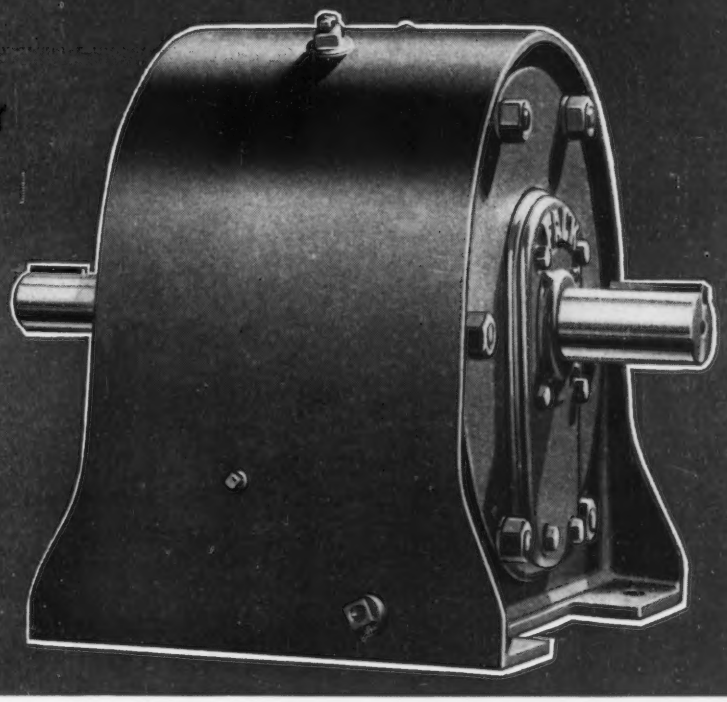
The versatile, STRAIGHT LINE

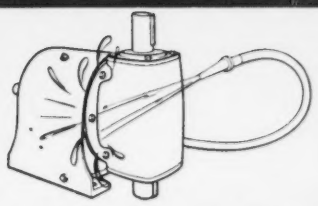


ALL-STEEL FALK SPEED REDUCER

(Concentric Type)

High and low speed shafts suitable for V-belt, gear or chain as well as coupling connections





The Type "C" Speed Reducer has these "In-built" Factors:

Sealed Housings. Dual closures and one-way vents keep oil in, dust and moisture out. Units are splash-proof, leakproof, dust-proof.

Positive Lubrication. Large sump capacity . . . oil-tight construction assures clean lubricant . . . direct dip of revolving elements provides positive lubrication at all speeds.

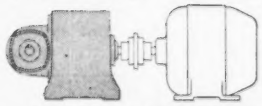
Precision Gearing. Heat treated alloy steel, precision cut and shaved helical gearing throughout . . . quiet-operating crown shaved pinions . . . taper bored gears for easy ratio changes.

Wide Speed Range. Selective ratio combinations provide output speeds from 1.5 rpm to 1430 rpm with stock gears.

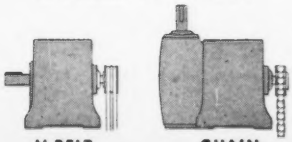
All-steel Housings. Unbreakable, strong, rigid. Generous overhung load capacities provided by wide bearing spans, large shafts and bearings.

Streamlined inside and outside. Smooth, clean surfaces; machine welded construction conforms to NEMA motor frames.

A FEW TYPICAL DRIVES FOR "C" AND "CB" UNITS



COUPLING TO "CB" UNIT



V-BELT TO "C" UNIT

CHAIN TO "CB" UNIT

Write for Bulletin 1104

The ideal type for Turbine, Engine or Special Motor

Here is an exceptionally versatile member of the famous FALK line of reduction units. The Type "C" Straight Line Speed Reducer is an all-steel concentric shaft unit rated in accordance with AGMA standards. It is structurally similar to the universally popular FALK Motoreducer, and offers many special application advantages.

It can be driven by motor, turbine or engine with direct coupling connection—or through a V-belt or chain drive. It lends itself effectively to hydraulic coupling, brake-wheel or overload protective coupling, multi-speed transmission, or to variable speed drives—without modification. Units can include self-contained backstop if desired. Ratio can be modified with easily installed stock gears. With modifications, unit can be used as a speed increaser.

These all-steel Straight Line Speed Reducers are *available for prompt delivery* in standard ratios in horizontal and vertical concentric models, also in horizontal and vertical right-angle models; in single, double, triple and quadruple reduction. For full details, write for Bulletin 1104.

FALK ...a good name in industry

THE FALK CORPORATION · 3001 W. Canal St. · Milwaukee 8, Wis.

EIMCOS IN DRAWPOINTS FOR PRODUCTION LOADING

With more and more mining companies using drawhole systems adaptable to their properties new evidence supports the use of this method as the most practical and efficient means of fast development, efficient production and increased savings. Here are some of the important points to consider:

MECHANICAL LOADING	VS.	CHUTE AND GRIZZLY
After the entry is driven production can start immediately.	Development time.	Chute raises must be driven and timbered—grizzly must be developed then entry driven and production started.
Loading without spillage, ore drawn to haulage level.	Overall efficiency.	Loading with danger of spillage, ore drawn to grizzly level.
No lost time for repairs. Repair parts cost at approximately $.01 per ton loaded.	Operating maintenance costs.	Lost time for hang ups, lost time for chute repairs, cost of chute relining per ton varies.
100% salvage	Salvage value of equipment.	No salvage.
Safe working conditions, very little secondary blasting.	Safety.	Secondary blasting on grizzly level. Blasting in chutes to free clogged chute.

Add to these the advantages of loading cars full, easy operation even in wet places and a higher production per man shift. Write for information on many different mines that have changed to mechanical loading.

EIMCO

B-2

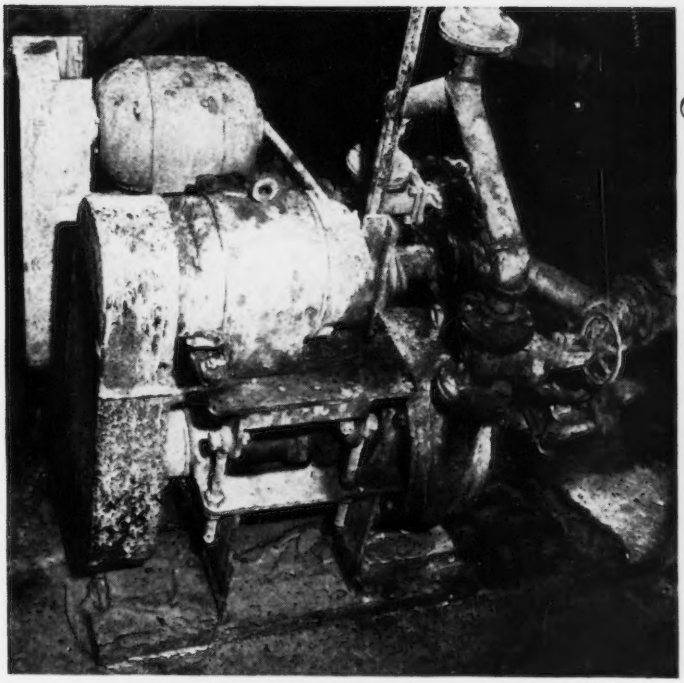
THE EIMCO CORPORATION

Salt Lake City, Utah, U.S.A.

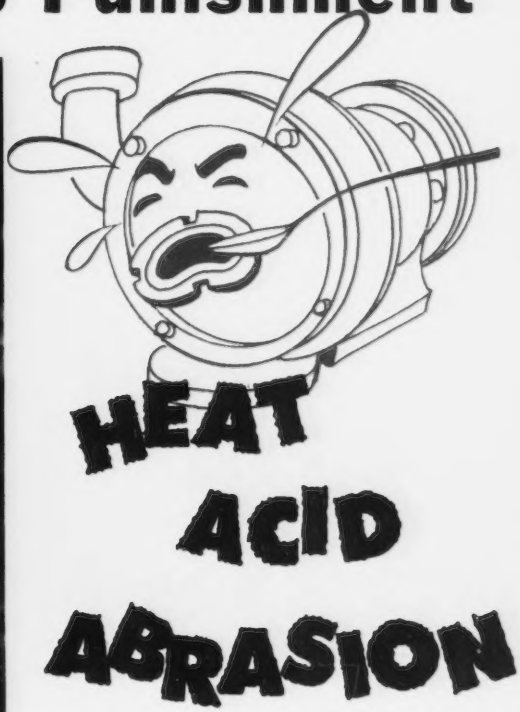
Export Office: Eimco Bldg., 52 South St., New York City

You Can't Beat An Eimco

Here's Real Pump Punishment



Vacseal Pump operating in Chemical plant — standby unit shown in background.



VACSEAL PUMP

solves this difficult problem

Heat, acid and abrasion add up to a mighty difficult pumping operation. But that is precisely the rugged job assigned to the Vacseal pump pictured above. This Vacseal installation is in a chemical plant, handling hot acid pulp, containing abrasive solids and sulphates in solution. Vacseal — rubber-lined and acid-proof — is in continuous service and keeps this vital plant operation moving smoothly and without interruption.

Vacseal is likewise handling the tough jobs in all industries where pumping operations are involved. It is a great favorite in the mining field . . . handling mill pulps, flotation concentrates, thickener pulps and classifier overflow. It also pumps fines from underground and mine shaft sinking. Write for detailed information.

Leaders in Experience & Service

THE GALIGHER CO.

METALLURGICAL DIVISION
THE GALIGHER COMPANY
ENGINEERING SERVICE

HOME OFFICE
545 West 8th South
Salt Lake City, Utah
P. O. Box 209

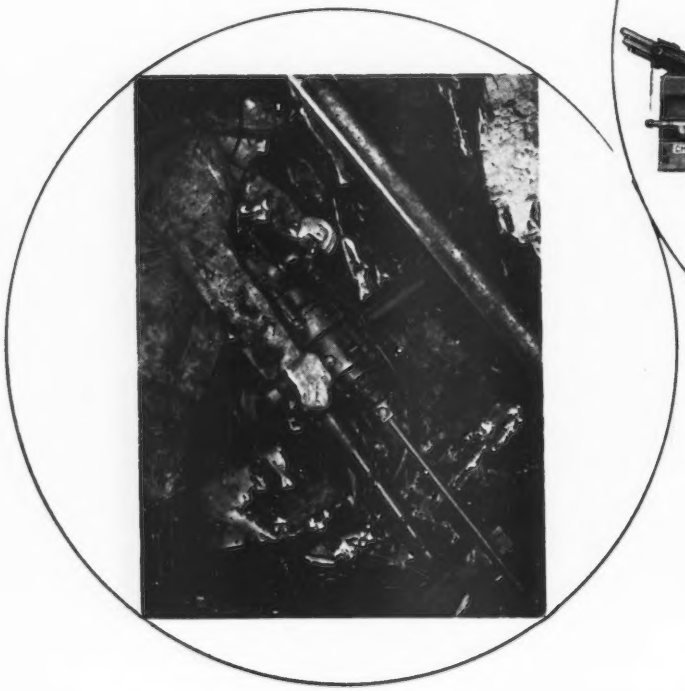
EASTERN OFFICE
921 Bergen Avenue
Jersey City, New Jersey

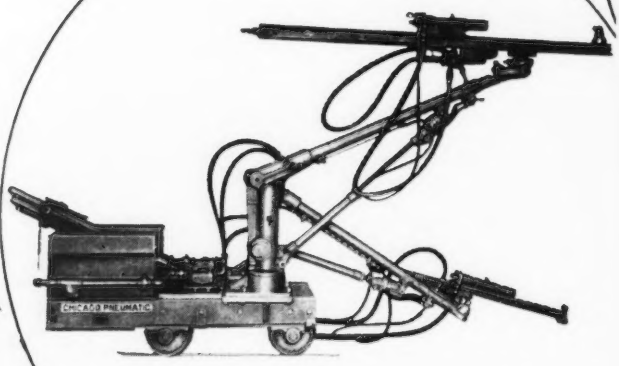
Agents In All Principal Foreign Mining Districts

CONSULTATION • ORE TESTING
PLANT DESIGN • GEOLOGIC INVESTIGATION

IT TAKES ALL KINDS OF DRILLS

For Faster Drilling – Designed both for blast hole and exploratory drilling, the air-driven CP No. 55 DIAMOND CORE DRILL has the most powerful vane-type air motor built into a diamond drill. Conservatively rated at 500 feet with E Rods and EX Fittings.





G-600 DRILL JUMBO with two typical drill mountings. The upper arm is equipped with a 6-foot Chain Type Feed; lower arm carries a 4-foot Shell Type Feed.

For Faster Tunnel Driving – The G-600 AIR ACTUATED DRILL JUMBO is rail mounted for standard track gauges and furnished in single and multi-boom units. Ideal when teamed with the CP-50N DRIFTER.

TO WORK A MINE!

← **For Stoping or Raising** – The well-balanced CP-34 STOPER has just the right piston speed, foot-pound blow, rotating speed and feed-leg pressure to insure long service from tungsten-carbide bits.
Has a ratchet-type twist throttle on the holding handle, for exceptionally fine control of feed-leg pressure.

↑ **For Top Performance** – The complete line of CP SINKER DRILLS ranges from the CP-22 (28-pound) to the CP-50N (102-pound) class. And – the CP-32 or CP-59 combined with the rugged CP AIRLEG mounting make a real team. The AIRLEG provides rigid, well-balanced support to effectively absorb all recoil.

. . . and whether it be for exploratory,
underground or open pit drilling there's a Chicago
Pneumatic drill for every type of mining.

And they all bear the familiar CP Trade Mark

– for 50 years a symbol that has spelled out high
quality and economy to thousands of satisfied customers.

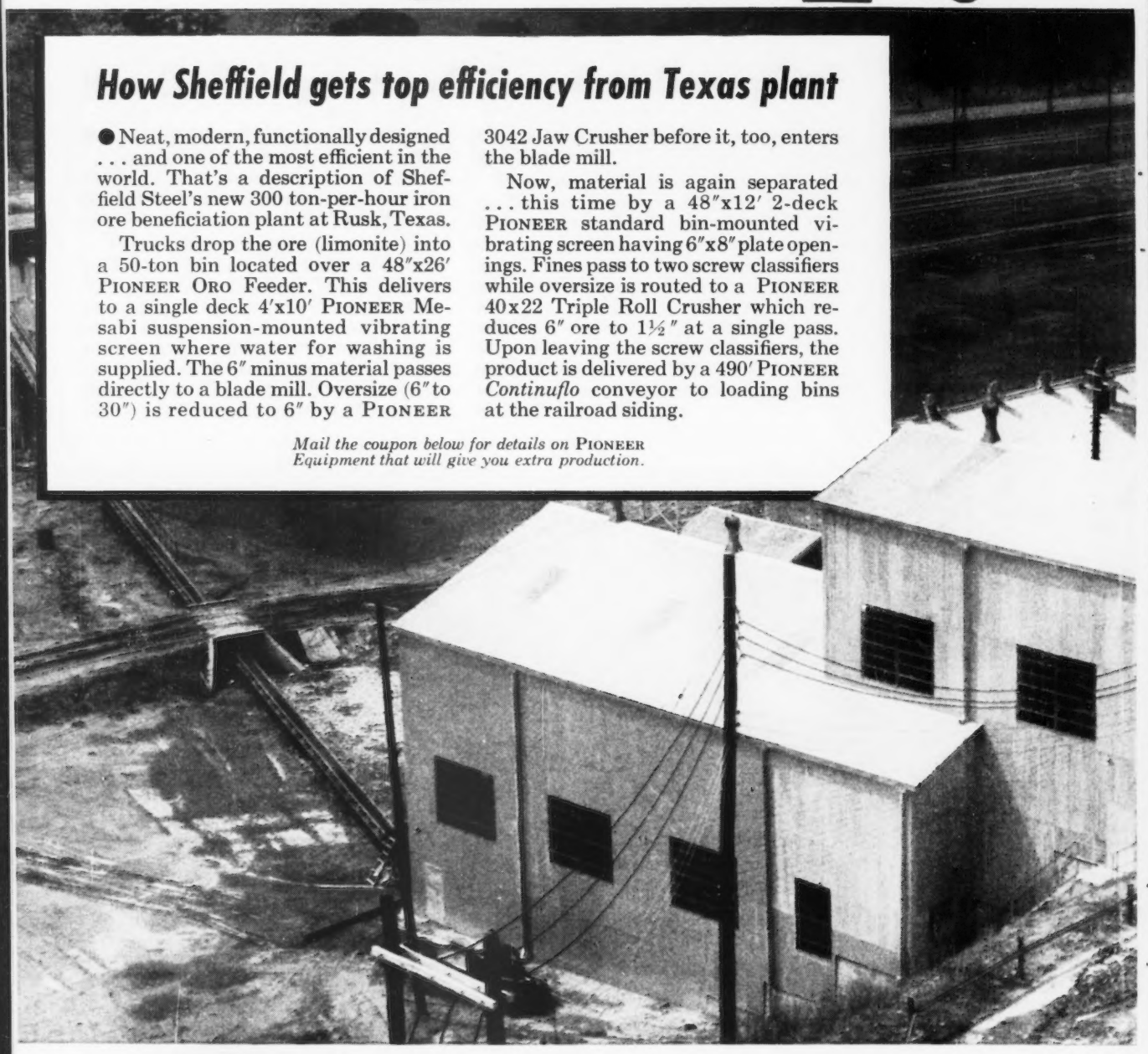
For more details, write *Chicago Pneumatic Tool Company,*
8 East 44th Street, New York 17, N. Y.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

When every dollar counts...

that Pioneer Edge



How Sheffield gets top efficiency from Texas plant

● Neat, modern, functionally designed . . . and one of the most efficient in the world. That's a description of Sheffield Steel's new 300 ton-per-hour iron ore beneficiation plant at Rusk, Texas.

Trucks drop the ore (limonite) into a 50-ton bin located over a 48″x26′ PIONEER ORO Feeder. This delivers to a single deck 4′x10′ PIONEER Mesabi suspension-mounted vibrating screen where water for washing is supplied. The 6″ minus material passes directly to a blade mill. Oversize (6″ to 30″) is reduced to 6″ by a PIONEER 3042 Jaw Crusher before it, too, enters the blade mill.

Now, material is again separated . . . this time by a 48″x12′ 2-deck PIONEER standard bin-mounted vibrating screen having 6″x8″ plate openings. Fines pass to two screw classifiers while oversize is routed to a PIONEER 40x22 Triple Roll Crusher which reduces 6″ ore to 1½″ at a single pass. Upon leaving the screw classifiers, the product is delivered by a 490′ PIONEER *Continuflo* conveyor to loading bins at the railroad siding.

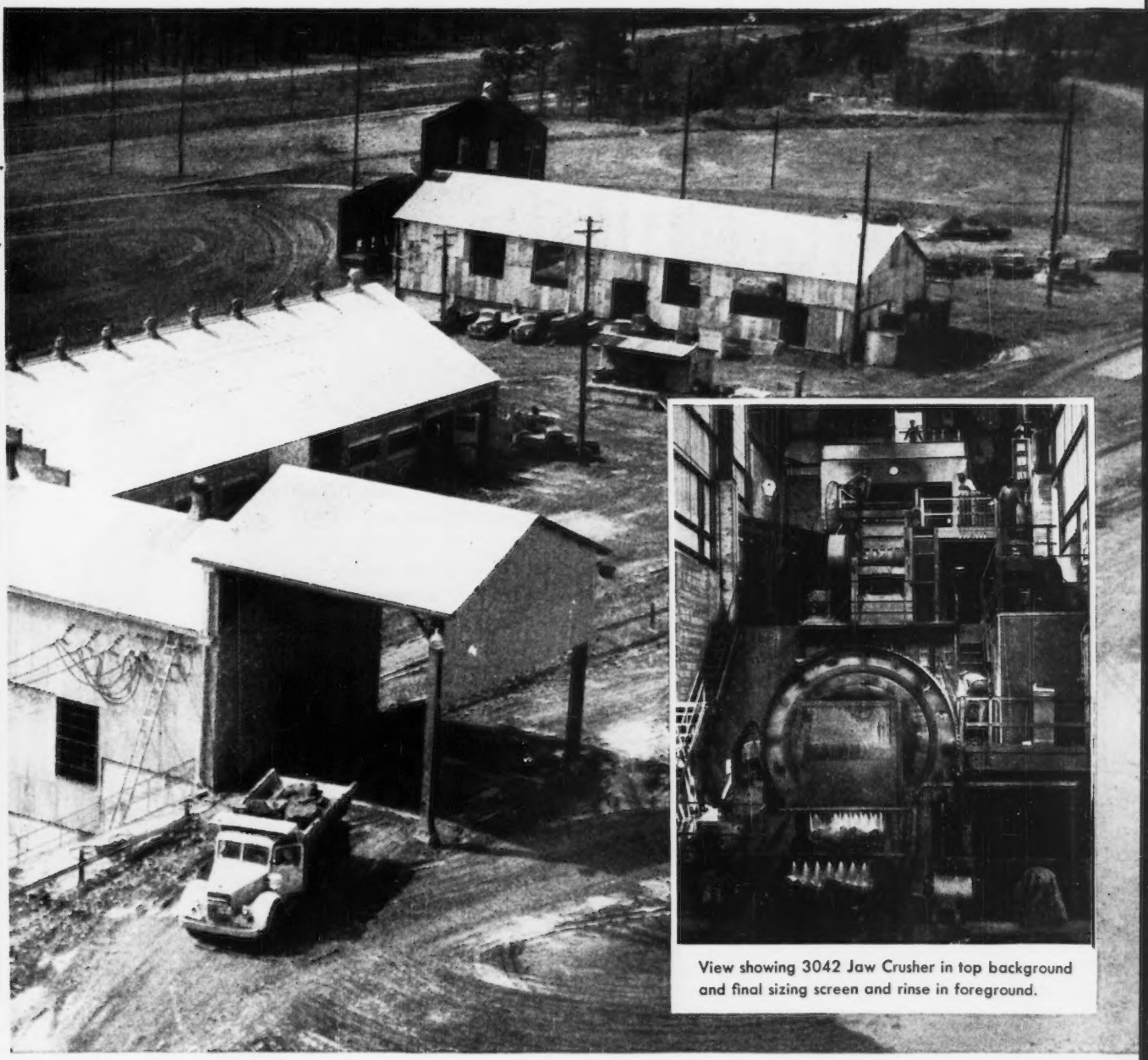
Mail the coupon below for details on PIONEER *Equipment that will give you extra production.*

BUY BOTH!
HIGHER OUTPUT
LOWER UPKEEP

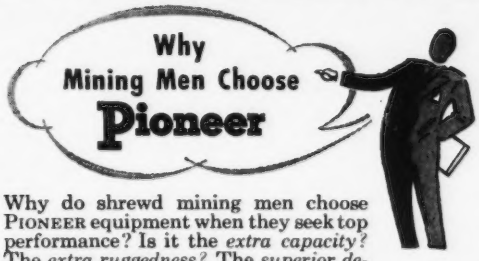
Pioneer

Continuflo EQUIPMENT

makes ore cost less



View showing 3042 Jaw Crusher in top background and final sizing screen and rinse in foreground.



Why do shrewd mining men choose PIONEER equipment when they seek top performance? Is it the *extra capacity?* The *extra ruggedness?* The *superior design and engineering?*

Actually, it's all of these which combine to offer the famous PIONEER EDGE . . . the operating advantage which is bringing extra profits to many a wise mine operator.

PIONEER ENGINEERING WORKS, INC.
1515 Central Avenue • Minneapolis 13, Minnesota
(SUBSIDIARY OF POOR & COMPANY • CHICAGO)

• Please send me information on the equipment checked.

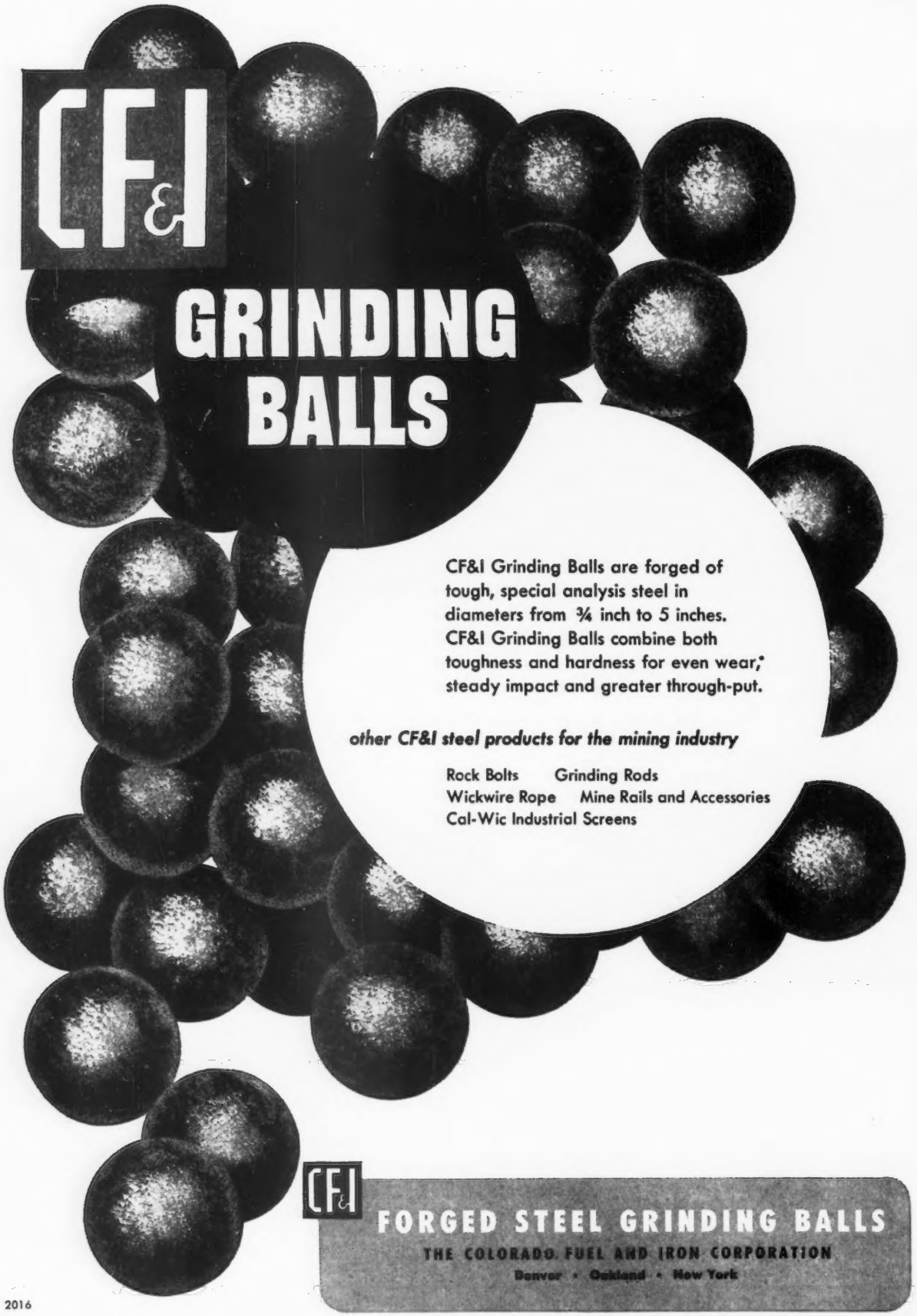
☐ JAW CRUSHERS	☐ GRAVEL PLANTS	☐ APRON FEEDERS
☐ ROLL CRUSHERS	☐ WASHING PLANTS	☐ MECHANICAL FEEDERS
☐ ROCK PLANTS	☐ BITUMINOUS PLANTS	☐ VIBRATING SCREENS
☐ ORO FEEDERS	☐ BITUMINOUS PAVERS	☐ CONTINUFLO CONVEYORS

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*____ *State*_____


CF&I
GRINDING
BALLS
CF&I Grinding Balls are forged of tough, special analysis steel in diameters from ¾ inch to 5 inches. CF&I Grinding Balls combine both toughness and hardness for even wear, steady impact and greater through-put.
other CF&I steel products for the mining industry
Rock Bolts
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THE COLORADO FUEL AND IRON CORPORATION
Denver • Oakland • New York

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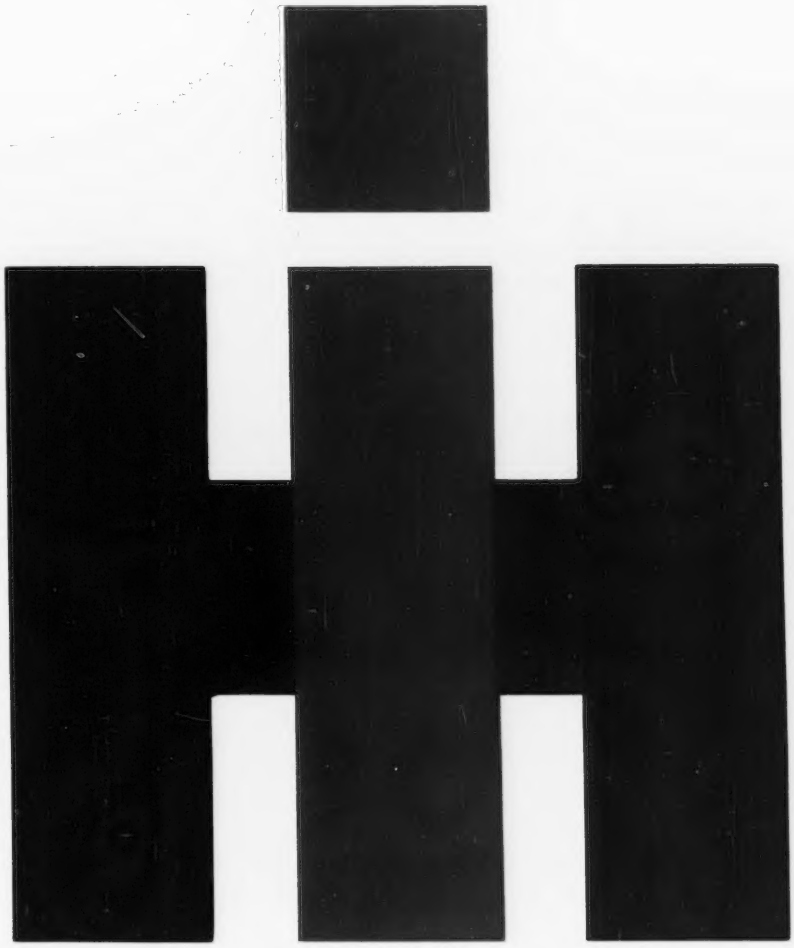


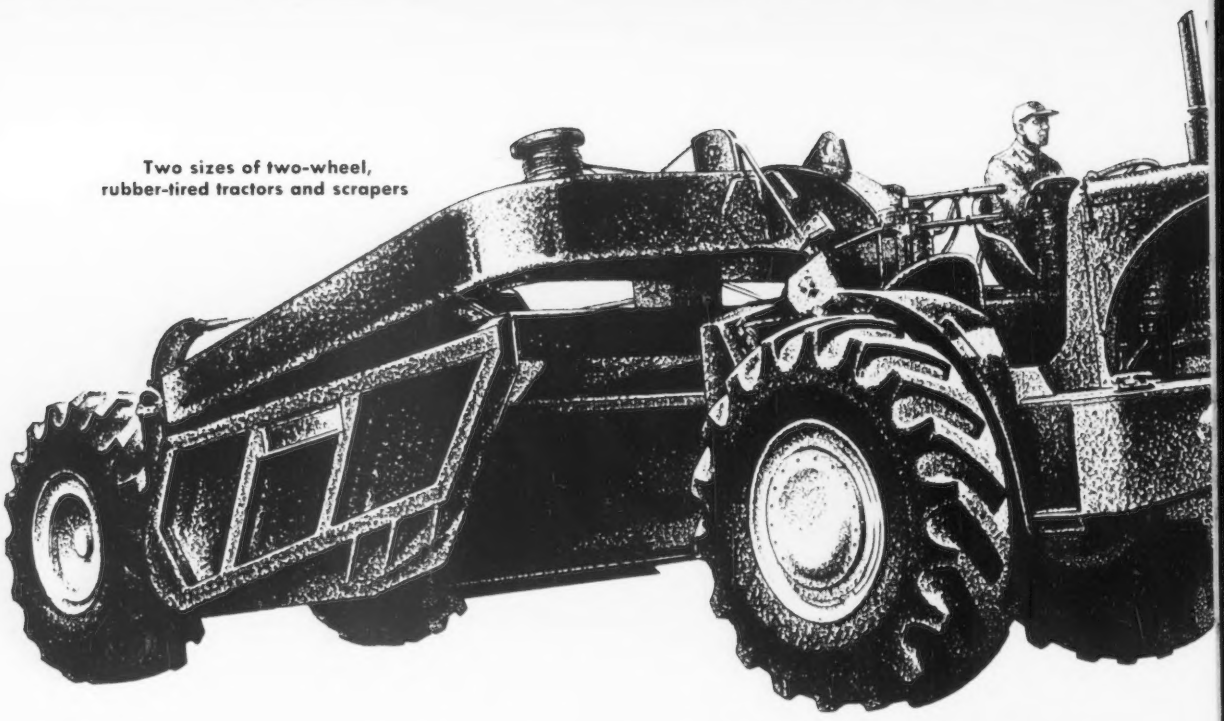
International Harvester and INTERNATIONAL Industrial Distributors present a complete line of modern earthmoving equipment, led by the INTERNATIONAL two-wheel, rubber-tired tractors with scrapers, and by "Big Red," the INTERNATIONAL TD-24, world's most powerful crawler

INTERNATIONAL HARVESTER

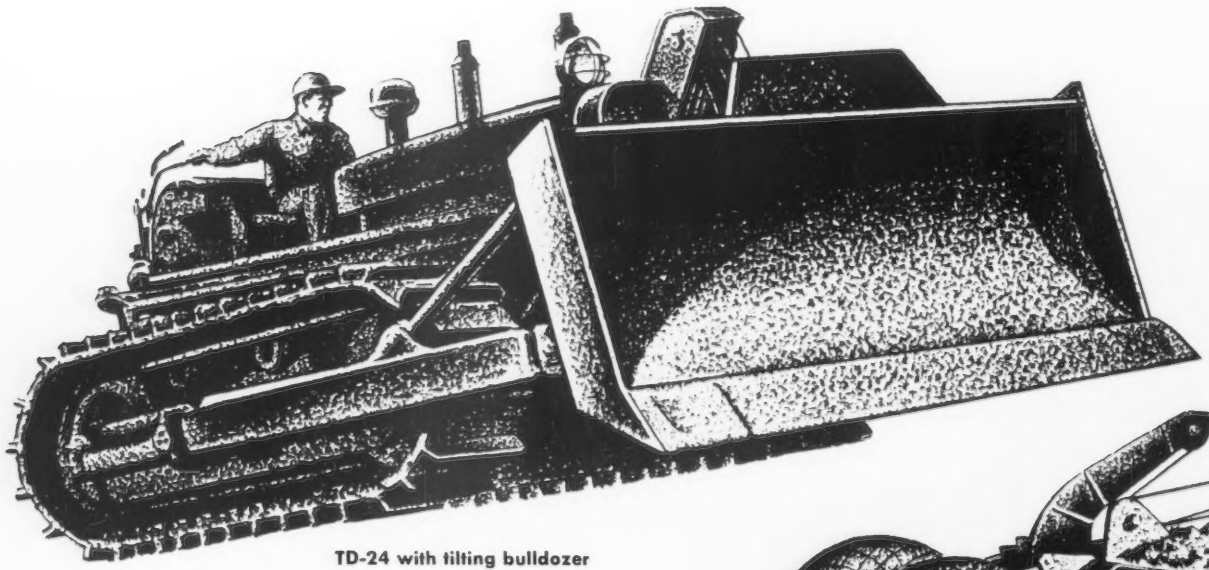
INTERNATIONAL

POWER TO MOVE THE EARTH

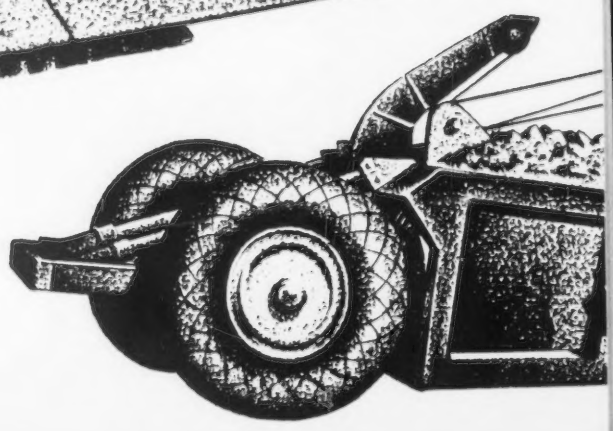
Two sizes of two-wheel,
rubber-tired tractors and scrapers



Now a complete earthmoving line that comes in the



TD-24 with tilting bulldozer



Two-wheel, rubber-tired tractor with wagon

Big Red Package

Got a big job to do? Call on INTERNATIONAL'S new Big Red Team!

- Seven rugged crawlers headed by the TD-24—most powerful crawler on the market!
- Twenty-two matching hydraulic and cable-controlled bulldozers and bullgraders, with land-clearing blades available!
- Four 4-wheeled scrapers!
- Two high-speed, two-wheel, rubber-tired tractors with scrapers (13 and 18 heaped-yard capacity)!
- A high-speed, two-wheel, rubber-tired tractor with bottom dump wagon (20 heaped-yard capacity)!

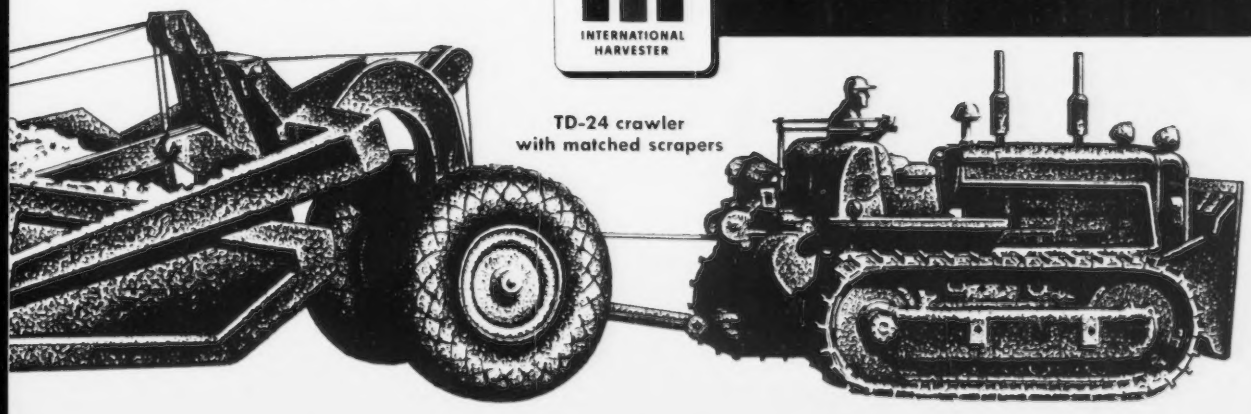
These great machines, now grouped under the INTERNATIONAL banner, have proved their dependability and economy to contractors for years on big projects around the world.

Your INTERNATIONAL Industrial Distributor has the equipment that will help you make a profit on any job you tackle. Call him for full details . . . or for actual demonstrations. See for yourself!

POWER THAT PAYS

INTERNATIONAL HARVESTER

INTERNATIONAL



TD-24 crawler with matched scrapers

Now All in One Family

the hardest-working work teams in the world!

The new INTERNATIONAL team stars not only a full line of rugged red INTERNATIONAL crawlers, complete with INTERNATIONAL scrapers and bulldozers, but also high-speed INTERNATIONAL two-wheel, rubber-tired tractors with scrapers.

This means that now, more than ever, your INTERNATIONAL Industrial Distributor is "Earthmoving Headquarters" for your area. He offers you IH equipment to tackle any job, backed up by unsurpassed service facilities and parts supplies.

He's at your call, always, to help keep your equipment rolling . . . to cut down your down-time and pile up your profit-time . . . to serve you with INTERNATIONAL "Power that Pays!"

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

INTERNATIONAL HARVESTER

INTERNATIONAL

POWER THAT PAYS

TD-24 crawler with matched scrapers

TD-18A crawler with matched scrapers

TD-24 crawler with bullgrader

TD-14A crawler with cable bullgrader

TD-9 crawler with hydraulic bulldozer

T-9 crawler with hydraulic bullgrader

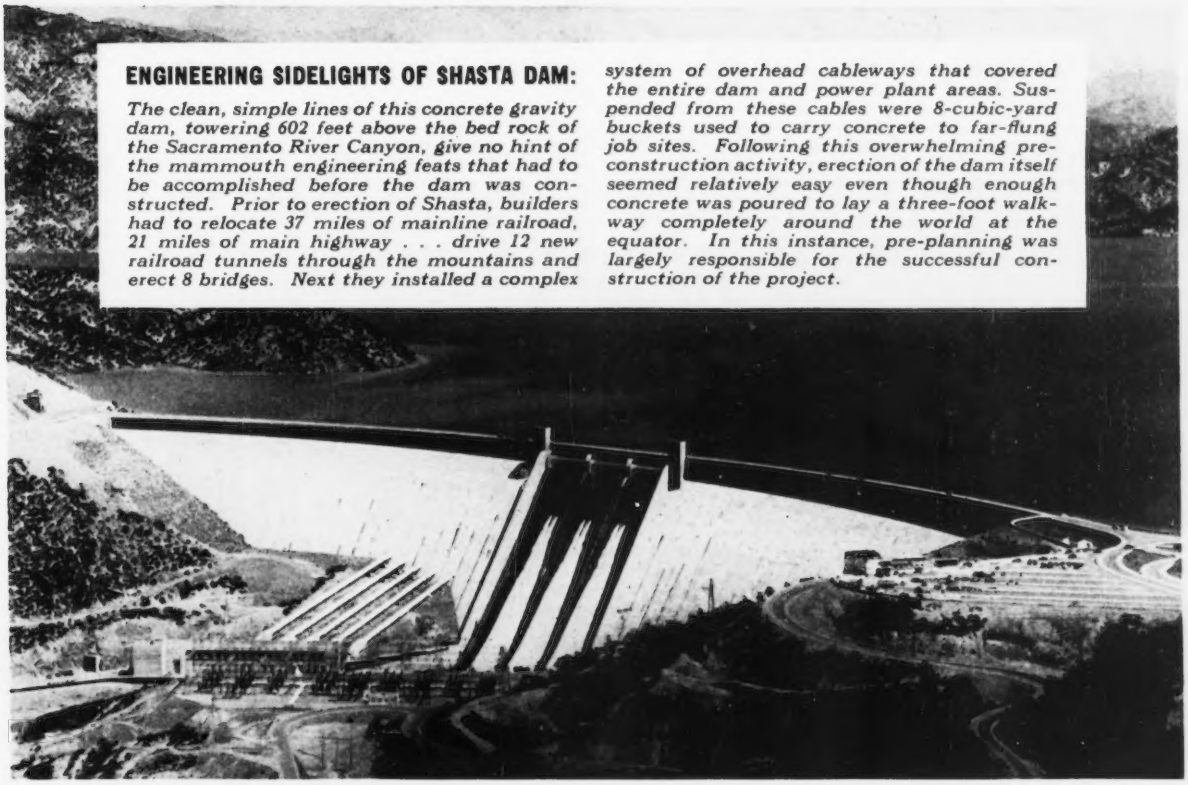
TD-6 crawler with hydraulic bulldozer

T-6 crawler with hydraulic bullgrader

Model 2T-75 two-wheel, rubber-tired tractor with 18 heaped-yard capacity scraper

Model 2T-75 two-wheel, rubber-tired tractor with 20 heaped-yard capacity bottom dump wagon

Model 2T-55 two-wheel, rubber-tired tractor with 13 heaped-yard capacity scraper



ENGINEERING SIDELIGHTS OF SHASTA DAM:

The clean, simple lines of this concrete gravity dam, towering 602 feet above the bed rock of the Sacramento River Canyon, give no hint of the mammouth engineering feats that had to be accomplished before the dam was constructed. Prior to erection of Shasta, builders had to relocate 37 miles of mainline railroad, 21 miles of main highway . . . drive 12 new railroad tunnels through the mountains and erect 8 bridges. Next they installed a complex system of overhead cableways that covered the entire dam and power plant areas. Suspended from these cables were 8-cubic-yard buckets used to carry concrete to far-flung job sites. Following this overwhelming preconstruction activity, erection of the dam itself seemed relatively easy even though enough concrete was poured to lay a three-foot walkway completely around the world at the equator. In this instance, pre-planning was largely responsible for the successful construction of the project.

A Traylor TC Gyratory Represents Half-A-Century of Engineering Planning to Solve Your Production Problems

In countless countries around the world you'll find producers depending on Traylor's curved crushing surfaces and non-chokable bell head features to assure steady output and boost production records. That's because the curved crushing surfaces in a Traylor TC Gyratory apply power as a direct crushing force to reduce lifting and churning . . . packing and choking. These are only two of many Traylor Engineering achievements which help you produce a more uniform cubical aggregate at less cost. Free Bulletin 7112 gives a complete outline and description of all Traylor features. Send for your free copy today.

Built in seven sizes with feed openings from 20" x 80" to 60" x 210".

TRAYLOR ENGINEERING & MFG. CO.
602 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • San Francisco
CANADIAN MFRS: Canadian Vickers, Ltd., Montreal, P. Q.

Traylor

Primary Gyratory Crushers | Rotary Kilns | Secondary Gyratory Crushers | Ball Mills | Jaw Crushers | Apron Feeders

Increase Your Output up to 300%...

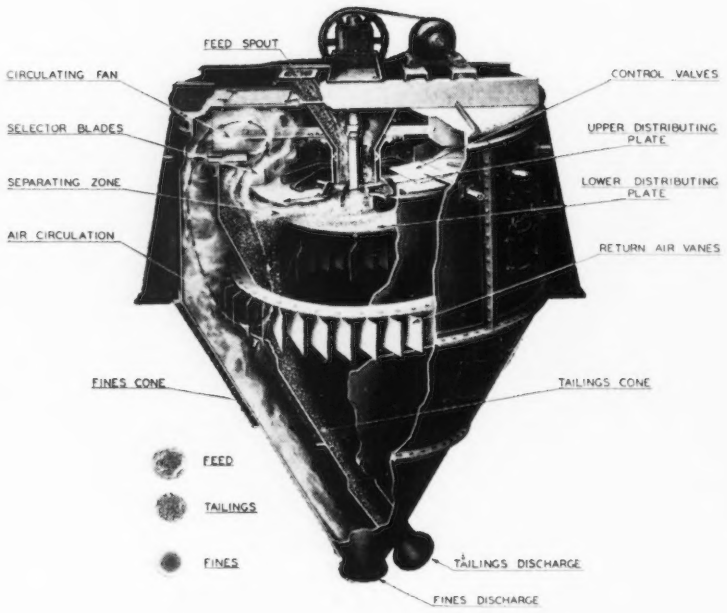
Get Accurate Fines with...

STURTEVANT

Whirlwind Centrifugal SEPARATORS

The Sturtevant Air Separator is one investment that pays off daily profits by increasing production and reducing costs. Its extremely efficient operation assures finer separation of fine material from coarse material with the result that uniform quality of product is always obtained.

They'll not only increase your output by as much as 300%, but provide 10 to 50% savings in power costs, too. They are available in sizes 3 to 16 feet in diameter with capacities from ¼ to 50 tons per hour with a fine-product range of 40 to 325 mesh or finer. Bulletin 087 gives the entire story. Write for your copy.

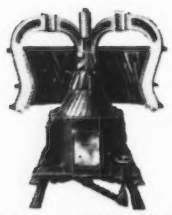


Other Sturtevant Equipment for Increasing Production and Cutting Costs

MICRONIZER® GRINDING MACHINE

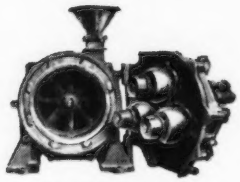
A fluid jet grinding machine, the Sturtevant Micronizer speeds reduction of materials to low micron sizes. These jet mills are especially applicable in fields where a particle size in microns is desired.

Sturtevant Micronizer grinding machines are available in many sizes and capacities.



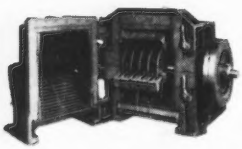
ROTARY FINE CRUSHERS

for intermediate and fine reduction (1" to ¼"). Open door accessibility. Soft or moderately hard materials. Efficient granulators. Excellent preliminary Crushers preceding Pulverizers.



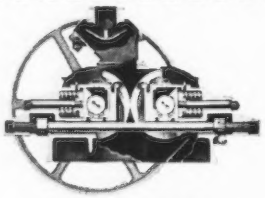
RING-ROLL MILLS

for medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operate in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



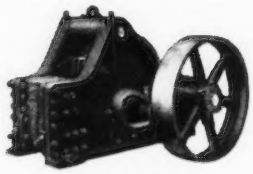
SWING-SLEDGE MILLS

for coarse and medium reduction (1" to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.



CRUSHING ROLLS

for granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8x5 to 38x20. The standard for abrasives.



JAW CRUSHERS

for coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.

STURTEVANT MILL COMPANY

101 CLAYTON STREET, BOSTON 22, MASSACHUSETTS

DESIGNERS & MANUFACTURERS OF CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS AND EXCAVATORS • ELEVATORS • MIXERS

It's PENTAERYTHRITETETRANITRATE . . . and it shoots at four miles a second!

"20,350 feet, to be exact. That's *fast* — but not too fast to permit relief of burden. I lay out my shots so that front line holes go a fraction before succeeding lines. I get better fragmentation — easier digging.

"Another thing — I always use the *right* Primacord for the job. Primacord is made in three types:

Plain — for small bore or shallow holes and trunk lines.

Reinforced — for deep holes. It's got a tough cover.

Wire Countered — for very deep, ragged holes, or with heavily reinforced explosives containers.

Plastic Reinforced — in river crossings, deep holes — or when field shots must stand a long time before blasting.

"I get good results every time because I always choose my Primacord as carefully as I use it."

P-11

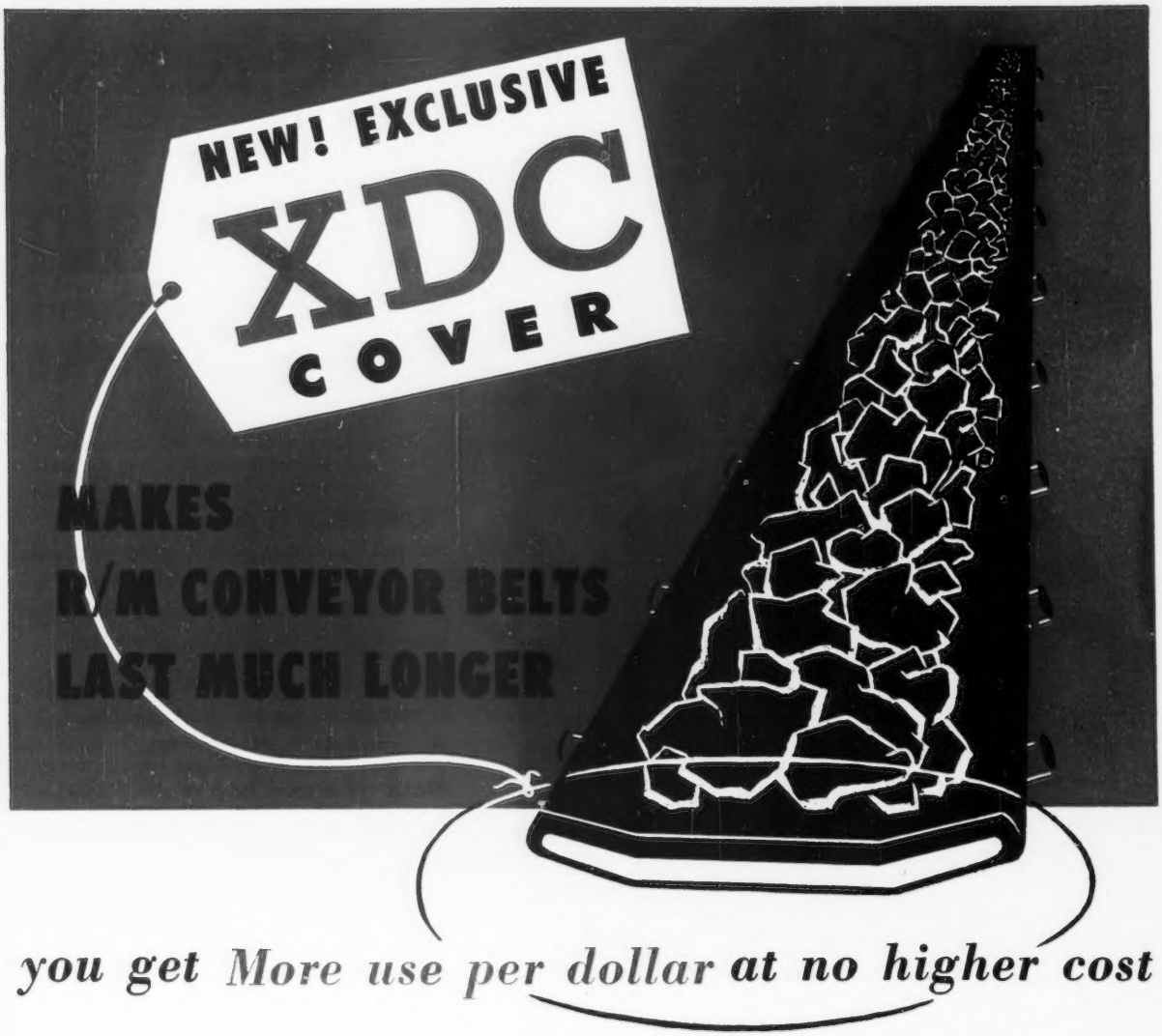
See your explosives supplier or write for information to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut

Also Safety Fuse since 1836

PRIMACORD® *detonating fuse*

PROVED and APPROVED



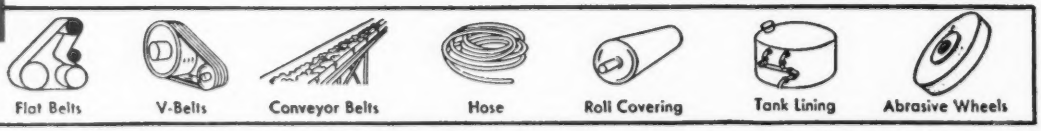
you get More use per dollar at no higher cost

Now, an amazing new conveyor belt cover compound developed by Raybestos-Manhattan provides phenomenal resistance to wear and tear. Most conveyor belt failures start with wear of the cover. "XDC" Cover greatly extends the life of R/M Conveyor Belts by giving protection never before attained against wear, abrasion, cuts and tears which lead to costly internal damage. The new "XDC" Cover greatly increases the benefits of Raybestos-Manhattan's other outstanding developments in conveyor belt design . . . Constructions like extra flexible RAY-MAN "F," extra-cushioned HOMO-CORD, HOMOFLEX and extra-high tension RAY-MAN. This major advance in rubber engineering puts longer life, "More Use per Dollar" into tough, dependable R/M Conveyor Belts. When you are thinking about conveyor belts, call an R/M representative.

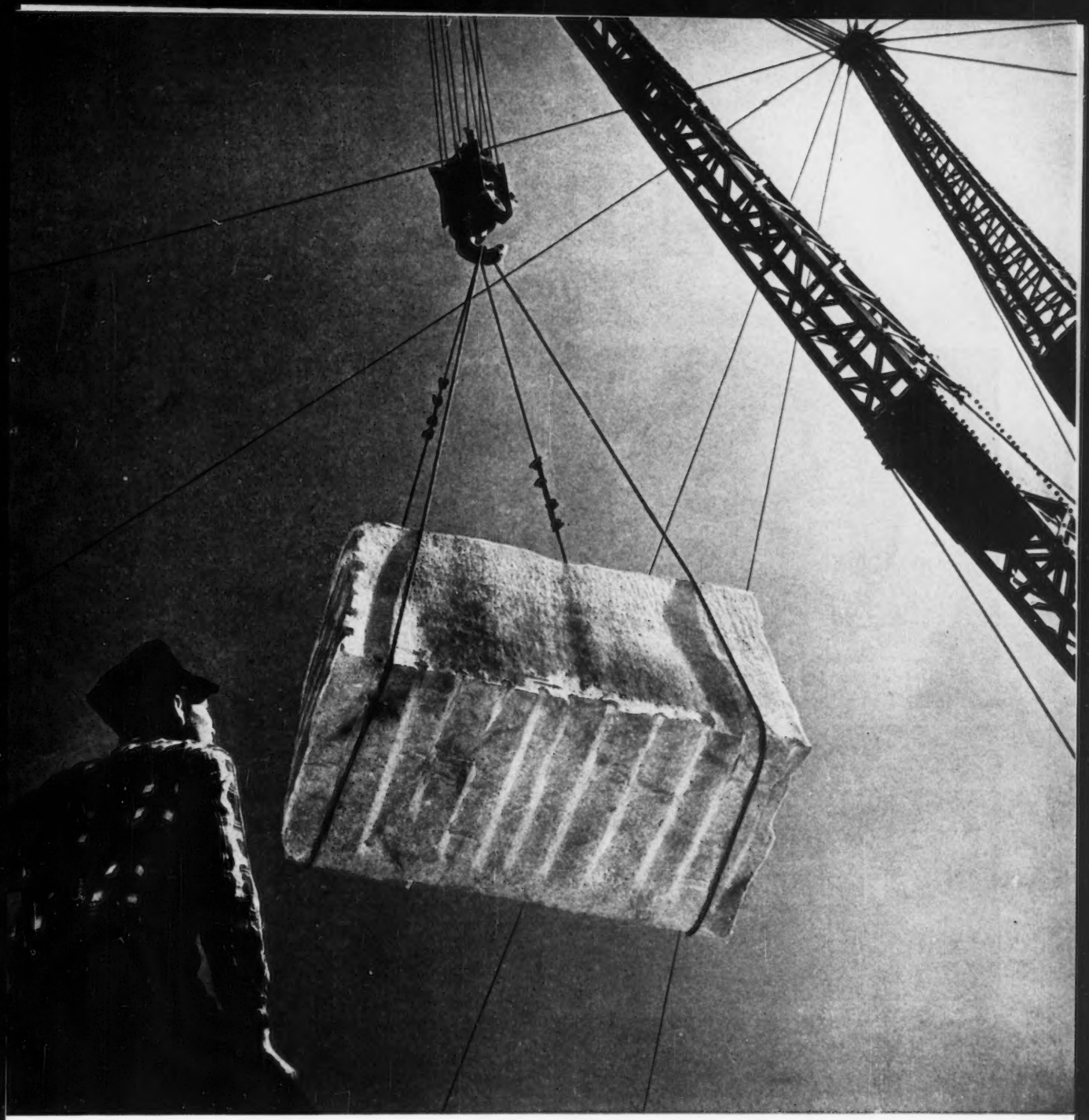
RM

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls



Wire Rope at Work—Some of the world's most beautiful marble comes from the eighteen quarries of the Georgia Marble Company. Through the years this firm has removed and marketed over 30,000,000 cu ft of the durable crystalline stone, which can be seen in famed buildings and memorials in every state of the Union.

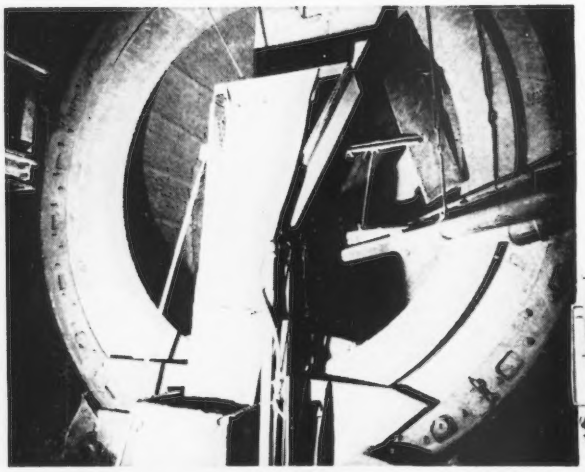
The block shown in the picture, a dozen tons of particularly fine white marble, was photographed emerging from one of the company quarries near Tate, Ga. This handling job involved a lift of 175 ft, and the hoisting was done by a stiffleg derrick equipped with sound, dependable Bethlehem wire rope. Here, as always, the Bethlehem rope met every demand with plenty to spare, for it is a product made to take such loads in stride.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

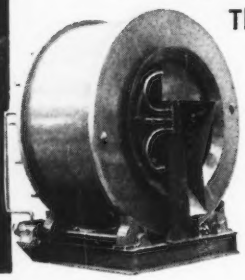
MINING • CONSTRUCTION • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

HOW OLIVER UNITED SELECTIVITY

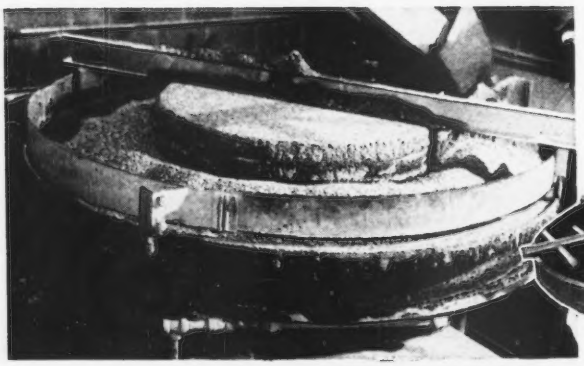


3 different Products . . . different Filters

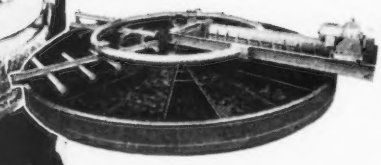
Dorrco Continuous Vacuum Filter installed in 1948 in the Austinville, Va., mill of The New Jersey Zinc Company where it is dewatering zinc concentrates.



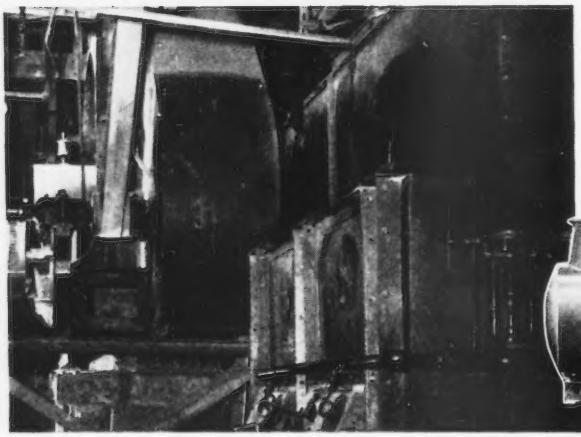
Today's Dorrco Filter is described in Bulletin 20-M



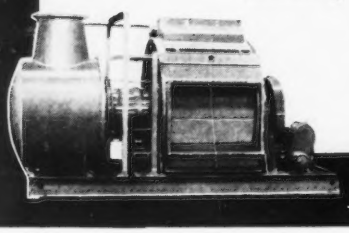
Oliver Rotary Sand Table installed in 1929 in the Franklin, N. J., Mill for dewatering jig middlings.



Today's Oliver Horizontal Filter is described in Bulletin 20-M



Oliver Top Feed Filter installed in 1930 in the Franklin Mill for dewatering and drying table concentrates (willemite). This type of filter can reduce solids to bone dryness, utilizing hot air or suitable gas as the drying agent.



Today's Oliver Top Feed Filter is described in Bulletin 10-G.

PAID OFF FOR NEW JERSEY ZINC

For a number of years, outstanding mining operations have been covered editorially as Feature Mining Enterprises. New Jersey Zinc is the latest, being preceded by such projects as Midvale, Morenci, Adirondack Iron Operations, St. Joe Lead, Cerro de Pasco, Climax Molybdenum, Chuquicamata, and others. It's significant that in the ore washing and dewatering departments of all of these big operations, Oliver United is the name plate on many filters being used. It's also significant that numerous different types of filters are involved.

Two factors, probably above all others, led to the choice of these filters:

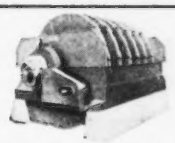
a . . . there was available to the buyers a far greater variety of filter types from which to select; it meant that the buyers could fit the filter into the flowsheet readily, rather than adjusting the flowsheet to the limitations of any single filter.

b . . . there were available far greater knowledge of and experience with filtration and dewatering problems on the part of Oliver United engineers who have served the metallic and non-metallic industries all over the world. Mining men buying important units like filters, do like to have them backed up by the broadest experience possible. This service these 'Feature Mining Enterprises' got from Oliver United.

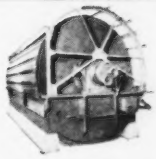
New Jersey Zinc is but one of many mining companies — to say nothing of the thousands in the process industries generally—that found in Oliver United these two desirable features of service: (1) wide filter type selectivity, and (2) broad knowledge of and experience with filtration. Adding to these a world-wide sales engineering service, strategically located manufacturing facilities, excellent testing facilities makes Oliver United service of real value to the mining industry.

MORE SELECTIVITY THROUGH THESE OLIVER UNITED FILTERS

Oliver Continuous Vacuum Filter — the mining industry's pioneering and now standard drum type filter with wide application, particularly when cake washing is required. Described in Bulletin 20M.



American Continuous Vacuum Filter—the mining industry's pioneering and now standard disc type filter with wide application, particularly for dewatering. Described in Bulletin 20M.



Oliver Panel Filter—a major modification of the standard Oliver Drum Filter, finding increasing application in the metallic and non-metallic fields. Especially suitable for those sticky cakes. No wire winding. Described in Bulletin 20M.

Sweetland Pressure Filter —industry's standard pressure filter (up to 50 pounds) for handling products not suitable for vacuum filtration; or for small batch operations. Wide application in refineries. Described in Bulletin 114. The Kelly Pressure Filter (Bulletin 113-R) is for higher pressures.

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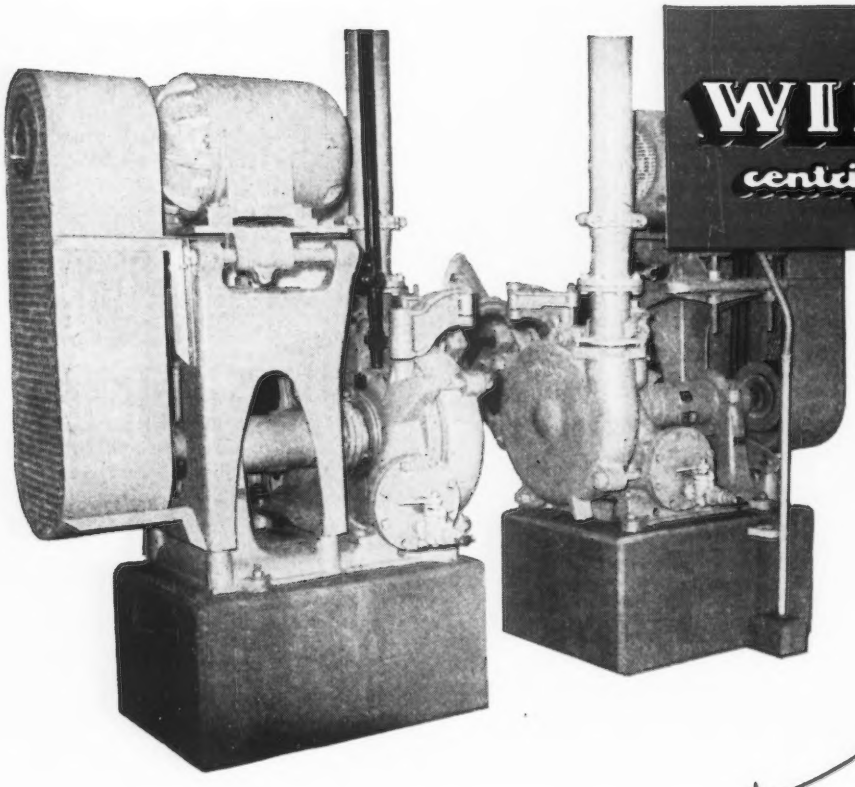

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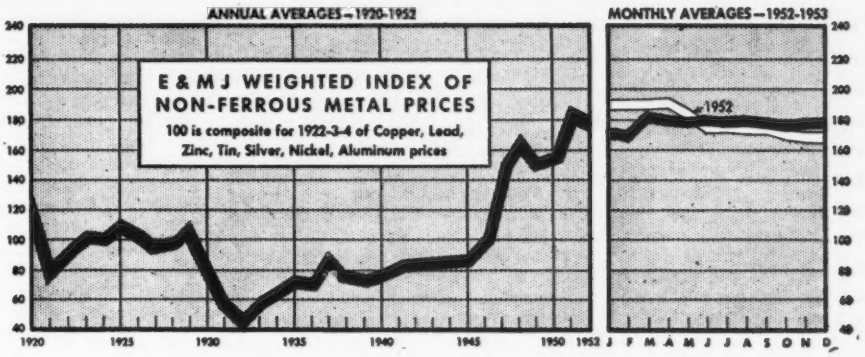
E&MJ OUTLOOK

PRICES



MARKETS

Surprising steadiness featured major non-ferrous metal markets as 1953 ended. The *E&MJ* index of non-ferrous metal prices actually edged higher, from 180.45 in November to 180.66 for December. Steadiness in copper and an advance in tin were responsible.

With trade on the Continent opening up, including the Iron Curtain countries, the outlook's brighter for increased consumer goods production abroad and, in turn, greater metal consumption. At least offerings of foreign lead and zinc in the U.S. are diminishing.

Painfully slow recovery seems in prospect for lead and zinc; copper is still in for a decline early this year, but it certainly hangs on!

•

LABOR

There's limited joy for mining in the jump the Anaconda locals made from Mine, Mill to the CIO Steelworkers union. It's a blow to Mine, Mill's left-wingers, all right, but it leaves them in control of what's left and it brings a powerful new union, eager to make a record, into Butte.

•

AT HOME

Business in general should be able this year to absorb some decline without letting it get out of hand. Flat predictions are foolish, but it does look as if the world, politically, economically, and, we hope, spiritually, will be in better shape by 1955 than it is right now.

Republic Steel is investigating another Peruvian iron orebody. It's hard, high-grade, and looks like good open hearth feed.

Willy-nilly, it looks as if Senator Malone's uproar about titanium will result in boosting production nearer the 35,000-ton yearly output the military wants. Problem is: what to do with that capacity when it becomes obsolete, as it very likely will before long.

It's pretty close to a toss-up, but Climax, with 28,000 tons daily ore output, is nearing Braden, the biggest underground mine in the world.

•

ABROAD

Russia's still selling strategic materials in the open market. All you're safe in reading into it is that they need money to buy consumer goods. They're selling manganese, chrome, platinum, gold, silver, and even asbestos.

Don't look now, but we think the State Department is trying awfully hard to do the job it is intended to do. More on this later.

MARKETS—Trends and Prices

Inventory Conscious Buyers Limit Purchases—Wide Spread in Foreign Copper Quotations

With the outlook uncertain and consumers decidedly inventory conscious, purchasing agents restricted their operations during December to provide for essential nearby requirements only. Sales of copper, lead and zinc were below the average for the year. Prices, in the face of this uncertainty, held up well, though the undertone in numerous instances was on the weak side. Aluminum producers maintained an optimistic front and look forward to a record year in both production and consumption.

The *E&MJ* index of nonferrous metal prices for December advanced slightly to 180.66, which compares with 180.45 in November. In December of the preceding year the index stood at 172.00, with price controls still in force on copper and tin. The moderate rise for December 1953 was caused by a fractional change in the domestic copper average and higher tin. Lead, zinc and aluminum were unchanged.

Chilean Copper Sales

Major Chilean producers were authorized to sell copper on a "competitive" basis. Both Anaconda and Kennecott sold Chilean copper in the U.S. market for December shipment, and, beginning Dec. 10, such sales were included in the *E&MJ* averages for foreign metal. Virtually all of the Chilean copper came out of stocks held in this country and available for immediate shipment.

There was general disappointment over the fact that the Chilean agreement had not been ratified by all parties concerned in the deal as the year ended. The hitch was attributed to delay in passing enabling legislation covering exchange and tax problems. The Chamber of Deputies postponed taking action in the matter until after the holiday period. Without definite assurances that all is well, the U.S. authorities could take no steps toward acquiring the large tonnage that has been offered for the strategic stockpile. There was also some doubt in market circles whether the Chileans really understand what is meant by a free market in copper.

Another work stoppage threatened Anaconda's properties in Chile, but an eleventh-hour agreement on wages was announced on Dec. 31. Labor disturbances also threatened to interrupt operations in Rhodesia.

U.S. consumption of copper, based on figures compiled for the fabricating division of the industry, dropped to 102,258 tons in November. This compares with 116,259 tons in October and the peak of 134,203 tons established in January, 1953. Unless consumption of copper improves in the first quarter, the available U.S. supply from foreign and domestic sources should be more than ample.

Prices realized in the domestic market by producers and custom smelters hardly changed all month. Producers held to the 30c. basis, with custom smelters at 29¼c. to 29½c., depending on month of delivery. In the foreign division, the price situation was confusing, with a rather wide spread between prompt and three-months copper. There was scattered business in March copper as low as 27.40c., f.a.s. N.Y. equivalent, with prompt and nearby showing a range of 28¾c. to 29.775c.

Developments in zinc centered around the problem of balancing supply and demand. Mine output has been dropping steadily because of pressure of low prices, and smelter output is being reduced at home and abroad. Producers look for some improvement in the statistics before the end of the first quarter of 1954. The foreign market has steadied on improved consumer buying in Europe.

Lead was maintained here at 13½c. all month. The undertone eased slightly toward the end of December. The squeeze in London has ended.

The United Nations Conference on Tin at Geneva approved a draft agreement "without the help and despite the hindrance of the U.S. delegation." To become effective, the agreement

Average Prices for December (E&MJ Quotations)

Copper:

Electrolytic, domestic, refinery	29.673
Electrolytic, export, refinery ..	29.061

Lead:

Common, New York	13.500
Common, St. Louis	13.300

Silver and Sterling Exchange:

Silver, New York, per oz. ...	85.250
Silver, London, pence per oz. ..	73.821
Sterling Exchange, "Checks"	281.074

Zinc:

Prime Western East St. Louis	10.000
Prime Western, delivered (g)	10.500

Tin:

New York Straits	84.644
New York, 99% min. .....(e)	83.644
Gold, per oz. U.S. price	....$35.000
Quicksilver, per flask	.....$185.923
Antimony (E&MJ) (d)	.... 31.970
Antimony, bulk, Laredo	.... 28.500
Antimony, in cases, Laredo	29.000
Platinum, refined, per oz.	..$91.000
Cadmium (a)	.....200.000
Cadmium (b)	.....207.500
Cadmium (c)	.....215.000
Aluminum, 99% plus, ingot	21.500
Magnesium, ingot	27.000
Nickel (f)	60.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.

(a) Cadmium average based on the producers' quotations.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin content.

(f) F.o.b. Port Colborne, U.S. duty included.

(g) Delivered where freight exceeds 0.5c.

Yearly Average Prices—1949-1953

(E. & M. J. Averages)

	1949	1950	1951	1952	1953
Copper, domestic, f.o.b. refinery	19.202	21.235	24.200	24.200	28.798
Copper, foreign, f.o.b. refinery	19.421	21.549	26.258	31.746	30.845
Lead, common, New York	15.364	13.296	17.500	16.467	13.489
Lead, common, St. Louis	15.172	13.096	17.300	16.266	13.288
Zinc, Prime Western, St. Louis	12.144	13.866	18.000	16.215	10.855
Tin, Straits, New York	99.336	95.539	127.077	120.473	95.845
Silver, foreign, New York	71.930	74.169	89.368	84.941	85.188
Quicksilver (per flask 76-lb.)	$79.458	$81.258	$210.125	$199.097	$193.032
Antimony, N. Y. (cases, l.c.l.)	40.229	30.906	45.666	45.524	37.402
Platinum, refined	$73.360	$76.556	$90.000	$90.000	$91.238
Cadmium (producers' quotation)	200.000	216.840	255.000	224.095	199.439
Aluminum, 99 plus percent, ingot	17.000	17.713	19.000	19.410	20.931
Magnesium, ingot	20.500	22.043	24.500	24.500	26.535
Nickel, electrolytic	40.000	44.792	54.000	56.500	59.888

Markets Continued on Page 106

requires ratification between March 1 and June 30, 1954. The plan provides for a buffer stock of 25,000 tons of tin; an initial floor price of 80c. per pound and a ceiling of $1.10; and export controls when the buffer stock has absorbed 10,000 tons and also when deemed necessary under existing market conditions.

Consumers of silver in the United Kingdom have been granted permission to acquire silver on the world market. The silver market in the U.K. is now acquiring sufficient supplies. The market for silver in the U.K. has eased a little. Foreign silver in N.Y. was unchanged.

"Free" Gold Market

Russia sold another 1-million oz. of gold to the British authorities and further offerings are expected. Despite such sales, free gold markets strengthened in most areas and transactions remained at about the same level during December as in the preceding month. Pick's World Currency Report quotes as follows, per fine oz.:

	COINS		BARS (12.5 kg.)	
	Nov. 30	Dec. 31	Nov. 30	Dec 13
NEW YORK, transit	.....	.....	$35.00	$35.20
MANILA	$41.00	$41.25	37.50	36.00
HONG KONG	41.00	41.50	35.25	37.30
BOMBAY	46.50	46.75	44.50	44.75
TANGIER	40.50	40.00	34.95	35.20
BEYROUTH	40.45	40.45	35.10	35.35
PARIS	44.50	43.75	35.85	36.00
BUENOS AIRES	42.50	42.00	35.80	36.25

Note: All prices are computed at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

Dec. 1953	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc Delivered (f)	Zinc East St. Louis
1	29.700	28.650	82.250	13.500	13.300	10.500	10.000
2	29.700	28.650	81.750	13.500	13.300	10.500	10.000
3	29.625	28.800	82.750	13.500	13.300	10.500	10.000
4	29.700	28.950	83.250	13.500	13.300	10.500	10.000
5	No Market	28.600	83.250	13.500	13.300	10.500	10.000
7	29.700	28.475	84.250	13.500	13.300	10.500	10.000
8	29.700	28.750	85.750	13.500	13.300	10.500	10.000
9	29.700	28.400	86.250	13.500	13.300	10.500	10.000
10	29.700	29.225	86.000	13.500	13.300	10.500	10.000
11	29.675	29.525	85.500	13.500	13.300	10.500	10.000
12	No Market	28.675	85.500	13.500	13.300	10.500	10.000
14	29.675	29.650	85.500	13.500	13.300	10.500	10.000
15	29.675	29.600	86.000	13.500	13.300	10.500	10.000
16	29.700	29.425	86.000	13.500	13.300	10.500	10.000
17	29.675	29.300	86.250	13.500	13.300	10.500	10.000
18	29.675	29.350	85.250	13.500	13.300	10.500	10.000
19	No Market	29.425	85.250	13.500	13.300	10.500	10.000
21	29.675	29.275	84.750	13.500	13.300	10.500	10.000
22	29.675	29.200	84.500	13.500	13.300	10.500	10.000
23	29.675	29.975	84.250	13.500	13.300	10.500	10.000
24	29.450	29.100	84.250	13.500	13.300	10.500	10.000
25	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
26	No Market	No Market	84.250	13.500	13.300	10.500	10.000
28	29.675	29.150	84.000	13.500	13.300	10.500	10.000
29	29.675	29.050	84.500	13.500	13.300	10.500	10.000
30	29.700	29.250	84.750	13.500	13.300	10.500	10.000
31	29.675	29.075	84.750	13.500	13.300	10.500	10.000
AVERAGES FOR MONTH							
Dec.	29.673	29.061	84.644	13.500	13.300	10.500	10.000
AVERAGES FOR WEEK							
Dec.							
2	29.694	28.796	83.900	13.500	13.300	10.500	10.000
9	29.685	28.663	84.250	13.500	13.300	10.500	10.000
16	29.685	29.350	85.750	13.500	13.300	10.500	10.000
23	29.675	29.254	85.042	13.500	13.300	10.500	10.000
30	29.625	29.138	84.350	13.500	13.300	10.500	10.000
CALENDAR WEEK AVERAGES							
Dec.							
5	29.685	28.763	82.875	13.500	13.300	10.500	10.000
12	29.695	28.842	85.542	13.500	13.300	10.500	10.000
19	29.680	29.458	85.708	13.500	13.300	10.500	10.000
26	29.619	29.138	84.400	13.500	13.300	10.500	10.000

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Dec. 1953	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold (d) London	Gold (d) United States
1	280.9375	85.250	74.0000d.	248s.	$35.00
2	281.0625	85.250	74.0000d.	248s.	35.00
3	281.0625	85.250	74.0000d.	248s.	35.00
4	281.0625	85.250	73.7500d.	248s.	35.00
5	(e)	(e)	(e)	(e)	35.00
7	281.1250	85.250	73.7500d.	248s.	35.00
8	281.1250	85.250	73.7500d.	248s.	35.00
9	281.0625	85.250	73.7500d.	248s.	35.00
10	281.2500	85.250	73.7500d.	248s.	35.00
11	281.1250	85.250	73.7500d.	248s.	35.00
12	(e)	(e)	(e)	(e)	35.00
14	281.1875	85.250	73.9375d.	248s.	35.00
15	281.1250	85.250	73.9375d.	248s.	35.00
16	281.0625	85.250	73.9375d.	248s.	35.00
17	281.1250	85.250	73.8750d.	248s.	35.00
18	281.0000	85.250	73.7500d.	248s.	35.00
19	(e)	(e)	(e)	(e)	35.00
21	281.0625	85.250	73.8750d.	248s.	35.00
22	280.9375	85.250	73.7500d.	248s.	35.00
23	280.9375	85.250	73.7500d.	248s.	35.00
24	281 1250	85.250	73.7500d.	248s.	35.00
25	Holiday	Holiday	Holiday	Holiday	Holiday
26	(e)	(e)	(e)	(e)	35.00
28	281.1250	85.250	73.7500d.	248s.	35.00
29	281.1250	85.250	73.7500d.	248s.	35 00
30	281.0000	85.250	73.7500d.	248s.	35.00
31	281.0000	85.250	73.7500d.	248s.	35.00
AVERAGES FOR MONTH					
Dec.	281.074	85.250	73.821	—	35.00
AVERAGES FOR WEEK					
Dec.					
2	281.063	85.250	—	—	
9	281.088	85.250	—	—	
16	281.150	85.250	—	—	
23	281.013	85.250	—	—	
30	281.094	85.250	—	—	

Calendar Week Averages, New York Silver: Dec. 5th, 85.250; 12th, 85.250; 19th, 85.250; 26th, 85.250.
(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300¢ per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075¢ for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125¢ to 0.15¢ per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered, in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35¢ per pound over the current market for Prime Western; Special High Grade 1.50¢.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The Daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one quarter-cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5¢ per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at .99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

Details of an exciting development in Japan are waiting for you back on p. 72. The story is about the extraction of both copper and zinc from a single electrolyte and got into the issue through the alertness and propensity for sleuthing of one of our editors.

Clue No. 1 was a manufacturer's advertisement concerning the problem of treating a copper-zinc concentrate in Japan. Clue No. 2 was an item on the new copper-zinc plant of Dowa Mining Co. which appeared in the July round-up of developments in Japan. Adding two and two and getting the customary total, our man cabled Alpheus Jessup, *E&MJ* correspondent in Tokyo, who went after the story with commendable vigor. Before we could say "electrochemical extraction" in Japanese, the manuscript plus a flowsheet, neatly lettered in Japanese was in New York.

Dowa has licked a difficult technical problem and certainly rates congratulations.

Leo A. Lyons, A.S.T.C., A.R.A.C.I., A.R.P.S., is the awesome by-line appearing on p. 96. To allay any idle curiosity aroused, these letters stand for Associate Sydney Technical College; Associate Royal Australian Chemical Institute; Associate Royal Photographic Society of Great Britain.

With that out of the way, you can get to Mr. Lyons' excellent report on progress in African metallurgy. Qualifications of the author include 15 years of experience with Electrolytic Refining and Smelting Company of Australia Pty. at Port Kembla, where he has been smelter superintendent for the past 6 years.

Mr. Lyons has traveled over much of Australia frequently accompanied by his wife and usually with several cameras. A year ago, with car, cameras and Mrs. Lyons, he went to Africa where he visited most of the large smelting operations. For this kind of traveling, the back seat of the car was removed and a flat floor built in to permit sleeping by the roadside with a minimum of annoyance from leopards and other local fauna.

Among Mr. Lyons' recollections of the trip was the purchase of petrol from a native one night by flashlight. The boy did his calculations in Swahili with a stick in the dirt, while Lyons desperately converted francs per liter into shillings per gallon. Like rolling a ten with two fives, this is known as "the hard way."

There is some ruminating material for explosives men in this issue. In the order of appearance, the first item, is "The Crusher or the Explosive—Which is the More Efficient Rock Breaker?" Fred C. Bond, Allis-Chalmers' well known authority on crushing and grinding, for the first time compares the crusher and the explosive on the basis of energy involved in breaking rock. The U. S. Bureau of Mines deserves an assist on this for providing a great deal of information on blasting in its recent report, "Taconite Fragmentation."

The second item is a blow-by-blow description of the preparation and detonation of an 86,000-ton blast at Cananea. Included in this piece by Arthur W. Ruff, assistant mine superintendent at Cananea, is one of the best discussions of fragmentation that we have seen in a long time.

Statistic: Last year the Government used 366 mi of red tape, for which it paid nearly $5,000. Federal Supply Service says it was used for tying up documents for storage. That's their story.

If your lunch box in the past few months has housed nothing more exciting than a salad without dressing, we have a recipe that the lady of the house can use to jolt you out of your noon time complacency. Pickled Bologna, it's called, and while we have never actually tasted it ourselves, there is an editor on the staff who has, and highly recommends it for the more adventurous diner. Ingredients are ring bologna, white vinegar, pickling spices (whole), and garlic. Instructions straight from our colleague's notebook, read as follows:

"Put bologna in jars. Boil vinegar and spices. When cool, pour over bologna and add a few cloves of garlic. To each gallon of vinegar used, add one 2-oz package of pickling spices."

Credit for this spectacular dish must go to Mrs. Carl Marquardt of Salt Lake City. Eat it in health.

We don't know who we're quoting, but he made the remark that if all the economists in the country were laid end to end they still wouldn't reach a conclusion.

If you are doing any shower singing these days, chances are that you are not singing "The Silver Dollar Country," and maybe it's better that way. However this is a song that has been dedicated to mining people in general and the Northwest Mining Association in particular, so we thought we ought to sample it for you. Here's how the chorus goes:

"Oh, the silver dollar country is a friendly place,
Everywhere you look there's a friendly face,
And the face on the dollar even smiles at me,
In the silver dollar country."

Of course, it loses something without the melody, but we'll stick with "Clementine"—has less significance perhaps, but more plot.

And while Culture is rampant, we should call to your attention, another musical note. To help celebrate the Centennial of the discovery of gold in Colorado, the folks at Central City are having an opera written. The libretto is based on the life of "Baby Doe" Tabor. The premier performance will be given at the Central City Opera House, naturally. More than this we do not know, except that the *New York Times* man who reported the development seemed to be in favor of the whole deal.

ENGINEERING AND MINING JOURNAL

JANUARY, 1954

Did The Conference Help?

EVERYONE WHO ATTENDED the conference organized in Washington in early December by Resources For The Future, Inc., came away asking himself, "Was it worthwhile?"

For a resumé of what went on, see our news pages, but for the answer to that question, you'll have to look a lot farther. Individual answers would range all the way from the sublime to the apoplectic.

Our own answer would be that the conference did help. It solved no problems but it did serve to shake slightly the beliefs of a good many individuals in the invincibility of their positions. This, it seems to us, is a necessary preliminary to getting agreement between two opposing points of view.

For example, it was at the conference that many "liberal" thinkers heard for the first time the mining industry's point of view on depletion allowances and tax revision. Some of them even paid attention to it.

This same realization of the other fellow's point of view could be seen taking place in the minds of those taking part in discussions on tariffs, subsidies, foreign trade, and public land laws.

To act effectively, the mining industry must act as a unit. This conference brought glimmerings of light on areas where even foreign and domestic interests could act in unity and, therefore, effectively. That such developments are valuable can hardly be questioned.

Why Not More Conferences?

THE FACT THAT THE Mid-Century Conference in Washington did, after all, plant a few new ideas in places where they may do some good leads one to the thought that another conference, planned differently, might really accomplish something.

Why do we say, "planned differently?" Simply because the Mid-Century Conference was not organized in a way that could produce results in the form of concerted opinion or action.

Actually it was not a conference at all, in the proper sense of the word. It was a series of town meetings, where anyone could get up and speak his mind, but where nothing could be done to achieve a unity of opinion. Obviously, in groups as large as 200 people, all that can be done is to try to hold the argument to specified topics, and take a vote at the end of it. The result may be a majority opinion of the group, but never a unified opinion.

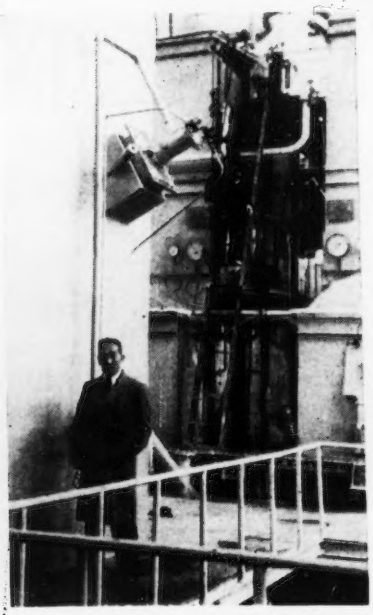
However, the Mid-Century Conference ruled out voting. Apparently, the conference's sponsor, the Ford Foundation, wanted simply to dramatize the country's resource problems by holding as huge and splashy a meeting as possible. There was far more attention paid to getting people down to Washington for the conference (and publicizing that fact) than was paid to determining how they might accomplish something when they got there.

If someone were to bring together for a conference no more than 15 informed, broadminded men, whose opinions and experience covered all sides of a problem, say the public land laws, it should be possible for them to reach effective conclusions, *if the right conference technique is used.*

We say this because we have recently seen in action a new and special technique for conducting conferences. Developed, tested, and used successfully by the New York School of Industrial Relations, sponsored by Cornell University, this technique of conference leadership has produced amazing results. Quite literally, it has brought together in unified action men whose opinions before the conference were apparently irreconcilable. It cuts out the big-meeting fog and generates lively, pointed discussion that sparks ideas and agreement.

We can testify that the technique works, but only if it is used by a leader who is familiar with it. Such a conference would create far less uproar than the Mid-Century Conference on Resources For the Future, but it would get a powerful lot more done. We'd like to see it tried.

COPPER AND ZINC are recovered in stages from a single electrolyte at the new Kosaka hydrometallurgical refinery (shown at left) of the Dowa Mining Co., Japan. The smelter is shown at right.



HIDESABURO KURUSHIMA, Dowa Mining Co.'s president, beside a Dorrco FluoSolids reactor.

How Dowa's Plant Extracts Cu-Zn From a Single Electrolyte

ALPHEUS W. JESSUP
McGraw-Hill World News
Tokyo, Japan

COPPER AND ZINC both are being recovered electrolytically by stages from a single solution in the hydrometallurgical plant of the Dowa Mining Co. plant at Kosaka, Japan. The process is made possible through use of Dorr Co.'s FluoSolids roasting method and an adaptation of a Japanese wartime electrolytic recovery of copper and zinc from brass.

Dowa officials state that production costs for copper are below those of its former smelting practice with the further extraction of zinc which went to waste in the slag piles. In addition Dowa will install a sulphuric acid plant next year to utilize sulphur dioxide gases from the FluoSolids reactor.

Development of the new process actually resulted from Dowa's search for a roasting method which would provide a stable sulphur dioxide source for an economical acid plant. The company had been plagued by large annual bills to compensate nearby farmers for the damage to their rice crops from waste gases. Hidesaburo Kurushima, Dowa's president, became interested in Dorr's FluoSolid experiments.

Following his personal investigation, he sent Suketoshi Tsunoda, refinery superintendent at Kosaka, to Dorr's laboratories in Stamford, Conn. Tsunoda built a pilot plant model of the Dorrco reactor. Recalling the wartime brass process, Tsunoda further suggested that it would be possible to recover copper and zinc from a single solution.

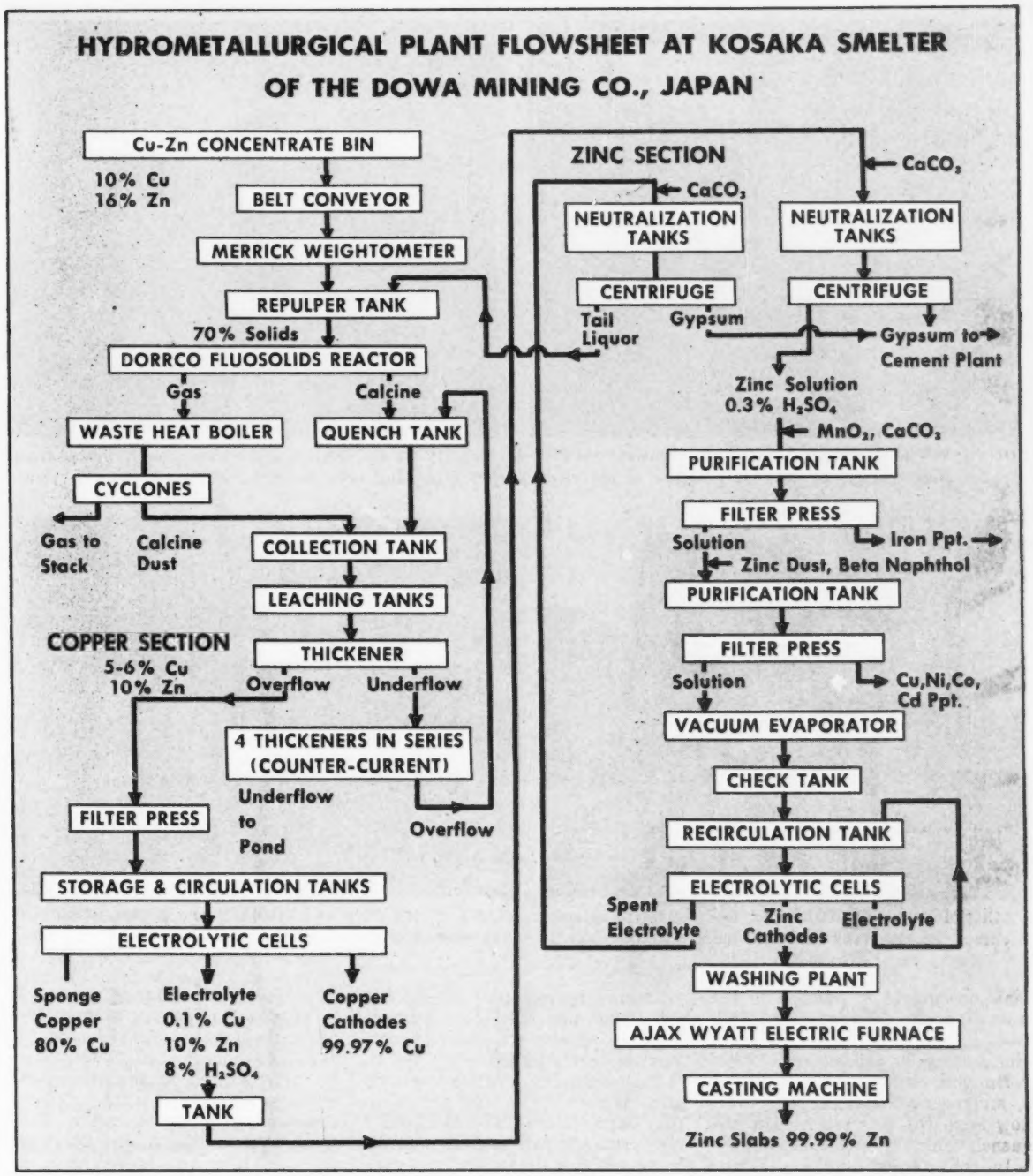
Today, the process is a reality and is completing its first year of operation. Operation of the plant is described in the following paragraphs.

Concentrate is shipped to Kosaka over Dowa's private railway from it Hanaoka mine. This contains 10% copper, 16 to 17% zinc, 22% iron, 35% sulphur, and 1.5 g gold, 300 g silver, and 30 to 50 g germanium per ton. The concentrate is dumped by lot into the feed bin and analyzed.

From the bin, the ore is charged onto a belt feeder with Merrick Weightometer and is discharged into a repulper tank which automatically prepares a mixture of 70% solids and 30% liquids for feeding into the Dorrco FluoSolids reactor.

The reactor is a 20-ft diameter and 16-ft high steel tank, double lined with an insulator and firebrick. It has a constriction plate in the bottom with 400 nozzles through which air is blown at a pressure of 3 to 3.5 psi to provide oxygen for the reaction and to agitate the roast. The overflow pipe through which approximately two-thirds of the calcine is drawn off is five feet above the constriction plate.

Inflow from the repulper is a little above the roast level. To prevent localizing in the bed, which at first caused considerable trouble, the charge is sprayed downward with compressed air. Temperature of the roast is maintained at 700 deg C., plus or minus 5 deg. Water is automatically pumped into the upper part of the reactor to prevent temperature from exceeding the allowable maximum. The copper and



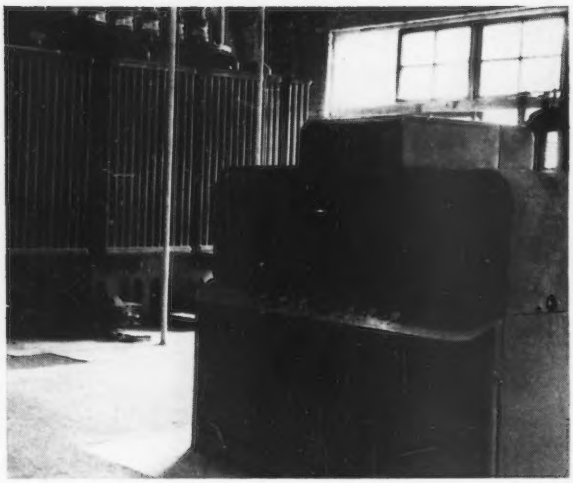
KEY STEPS IN THE ABOVE FLOWSHEET are: (1) Roasting of Cu-Zn concentrates in Dorrco FluoSolids unit. (2) Electrolytic extraction of copper. (3) Purification of spent copper electrolyte. (4) Electrolytic extraction of zinc. (5) Removal of gypsum. (6) Recycling of spent electrolyte. Sponge copper goes to converters.

zinc sulphides are transformed into sulphates and traces of oxides. Iron sulphide becomes ferric oxide.

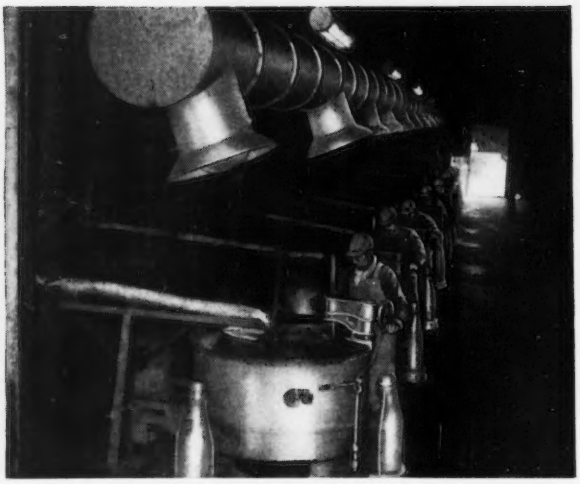
The overflow (2/3 of the calcine) goes into a quench tank of water agitated with air. One-third of the calcine carries over with the gases into the waste heat boiler. Here solids are extracted through cyclones, and sent to a quench tank. The remainder is recovered in cyclones and passes through quench tanks.

All quench tanks feed into a single collection tank from which the calcine is pumped into a series of three agitators and onto continuous counter-current decantation comprised of a series of five Dorr thickeners.

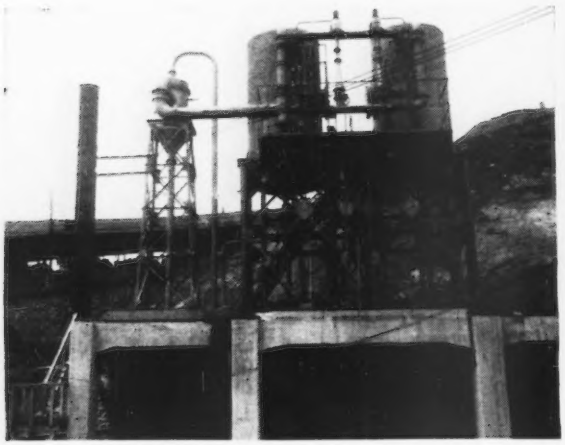
Overflow from the first thickener, containing 5 to 6% copper, 10% zinc, and 0.2% iron, goes through filter presses and on to the copper tank house. Residue from the No. 1 thickener is pumped into No. 2 thickener, from No. 2 into No. 3, No. 3 into No. 4, and No. 4 into No. 5. The residue from No. 5 thickener representing 40 to 45% of the orig-



CONTACT UNIFORMER, a new highly-efficient rectifier supplies direct current to the copper section of the plant.



LINE-UP OF CENTRIFUGES which extract gypsum from electrolyte for sale through company's cement plant.



VACUUM EVAPORATORS cool the electrolyte before it enters the zinc tank house of the electrolytic plant.

99.99% PURE ZINC CATHODES are produced in this tank house containing rubber-lined steel electrolytic cells.

inal concentrate is pumped to the waste dam. It contains 45 to 50% iron, 0.7% copper, 3 to 4% zinc, plus some gold and silver.

No. 5 thickener decants into No. 4, and so on to No. 2. The overflow from No. 2 is returned to the quench tank for recirculation.

In the copper tank house, the solution passes through three stages. In the first two, cathode copper of 99.97% purity is obtained. The third produces sponge copper containing 80% copper and 4% zinc.

The first stage draws the copper concentration of the electrolyte from 60 g per liter down to 25 g per liter. The voltage is 2.2 at 110 amp per square meter; temperature is 45 deg C. In the second stage, the concentration is brought down to 12 g per liter with 1.9 v, 60 amp per square meter, and temperature 50 deg C. The final copper electrolysis producing sponge recovers all but one gram per liter. The current is 3.5 v, 110 amp per square meter. Temperature runs 55 to 60 deg C.

The remaining solution contains 0.1% copper, 10% zinc and 8 to 10% sulphuric acid, as well as other "impurities." This is first neutralized with fine limestone; the gypsum produced is shipped to a cement plant, but Dowa plans to build a gypsum board plant soon. The traces of iron are removed next by adding more limestone and manganese oxide and removing the precipitate in a filter press.

Zinc dust is then added to precipitate the remaining trace of copper, nickel, and cadmium. Beta naphthol precipitates the cobalt. Dowa is building a cadmium tank house to recover the cadmium in this precipitate which is being saved.

The temperature of the solution as it leaves the filter press is 50 to 60 deg C. Vacuum evaporators bring the temperature down to 20 deg C. Cathode zinc of 99.99% purity is recovered in the zinc electrolysis. The current is 3.8 v, 300 to 400 amp per square meter. The spent electrolyte contains 20 g of zinc per liter and is recirculated into the No. 3 thickener.

Zinc cathodes are stripped every 24 hrs. The zinc is melted in an Ajax-Wyatt electric furnace and cast into slab zinc.

Power consumption runs about 2,400 kwh per ton of cathode copper, 5,000 kwh per ton of sponge, and 4,000 kwh per ton of zinc.

According to Japanese research, the process is possible when a solution contains 10% zinc and up to 6% copper. Therefore, it is effective to utilize the ore there which contains copper and zinc in a ratio of 1 to 1.5 or 1.6.

Machine Loading At Renabie Mines

- **Eliminates Chutes**
- **Cuts Delays**

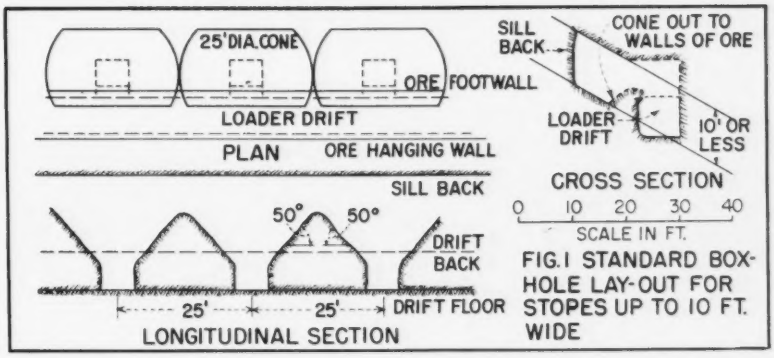
P. S. CROSS
Mine Superintendent
Renabie Mines, Ltd.
Ontario, Canada

RENABIE MINES LTD., only gold producer in the Missanabie gold area, of Sudbury district, has been in production since July 1947. From this date to Dec. 31, 1952, some 695,665 tons of ore have been treated, over 95% of which has been loaded with mucking machines operating at loader drift box-holes under shrinkage stopes. This article outlines current loading practice at Renabie.

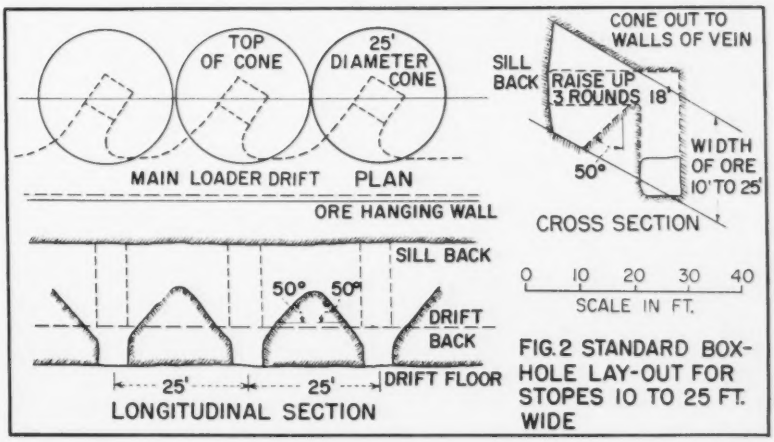
Orebodies at Renabie vary in width from narrow quartz veins of 5 ft. to large irregularly shaped quartz zones up to, and sometimes in excess of, 100 ft. Lengths vary from 30 ft. for the narrow veins, to 300 ft. for the large orebodies. While the vein-type of deposit has a uniform strike, large orebodies are of irregular strike and vary considerably in size and shape from level to level. The dip, however, is generally constant for both types of deposits, varying from 55 to 60 deg. to the south. There is also a consistent plunge of 60 deg. to the west.

Ore zones, of which there are nine to date, are of the quartz replacement type of deposit in large shear zones developed in granite gneiss along the footwall side of major faults which traverse the surrounding country for great distances. Thus far, no evidence has been found of major movement along these ore faults.

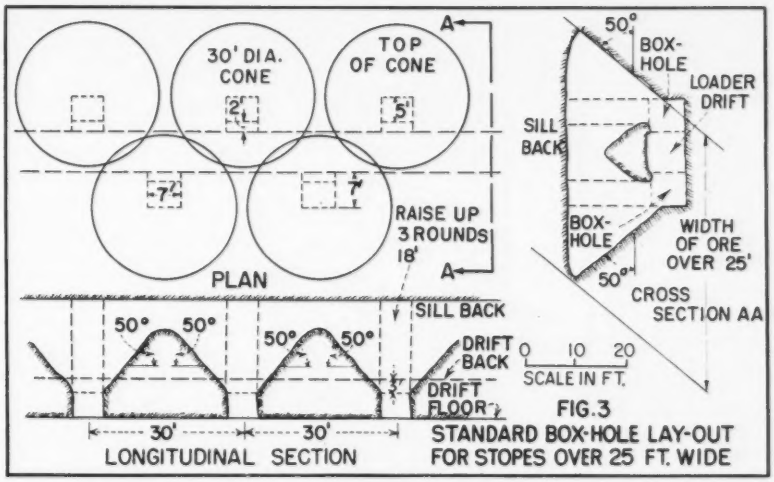
Shrinkage stoping is used exclusively throughout the mine. The hanging-wall contact of the ore is usually a fault and the ore breaks off easily to this fault leaving a smooth, solid stope wall. Beyond the fault is massive granite gneiss which stands well. There is little sloughing unless the hanging-wall fault zone is heavily sheared.



IN NARROW VEINS, up to 10 ft. wide, the loader drift is driven near the hanging wall of the vein. Cones are belled out to the width of the vein.



IN INTERMEDIATE WIDTH VEINS, 10 to 25 ft. wide, the main loader drift is driven along the hanging wall. Cones are belled out to 25-ft. diameter.



IN WIDE VEINS, 25 ft. or wider, the main loader drift is driven near the footwall. Two rows of cones are belled out to 25-ft. diameter

Drilling, in the large stopes, is done using power-feed DA 35 Ingersoll-Rand drifter machines with 1-in. Q.O. Atlas Chippewa drill feed steel in 30-in. changes with Craig detachable steel bits. Extensive testing with the light air-leg type of machine using tungsten carbide bits has proven that steel bits are much more economical in this ground. The cost per foot drilled with tungsten carbide bits was found to be 14.6¢ as against our present drilling costs with steel bits of 8.0¢ per ft. drilled.

Steel costs have been included in both these figures. The difference in cost per foot drilled is due to the very abrasive type of quartz resulting in excessive gage loss and low footage on tungsten carbide bits.

In narrow stopes, 20 ft. or less in width, J-50 Ingersoll-Rand Jackleg machines are used with 1-in Q.O. steel and Craig detachable steel bits.

In wide stopes over 20 ft. in width, breasts 12 to 15 ft. high are carried the full width of the stope for the entire length of the ore. Little arching of the back is required and no pillars are necessary. The drill hole pattern is 4 ft. by 3 ft., yielding one ton per foot of hole drilled. Holes are drilled 11 to 14 ft. deep, depending upon width of the breast and drilling time required. A 40 to 50-ft. breast requires two machine shifts to scale, set up, drill off and blast, yielding approximately 400 tons, or 100 tons per man-shift.

A 12-ft. bar is usually set slightly to the footwall side of the center line of the breast. The machine is mounted on 20-ft. arm, thus requiring only one set-up for the complete breast. These breasts are usually started over a manway at one end of the stope. One cribbed manway, 5 ft. by 5 ft. is carried up with the stope from the level below.

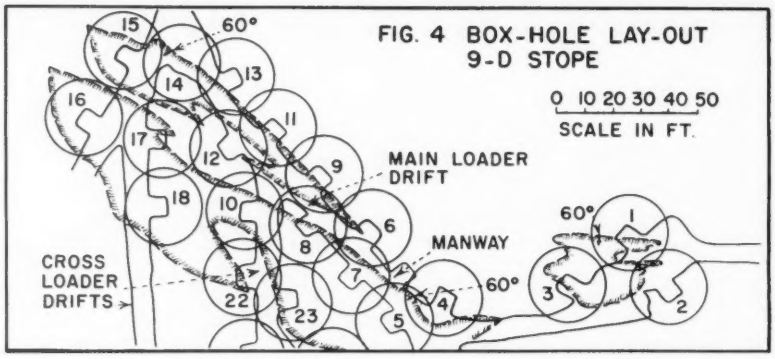
One or two small stope raises, depending upon the length of the stope, are driven from the stope sill to the level above. The raise section is 5 ft. by 5 ft. All service is by way of these raises.

In the narrow vein stopes in which the air-leg type of machine is used, breasts 8 to 10 ft. high are carried.

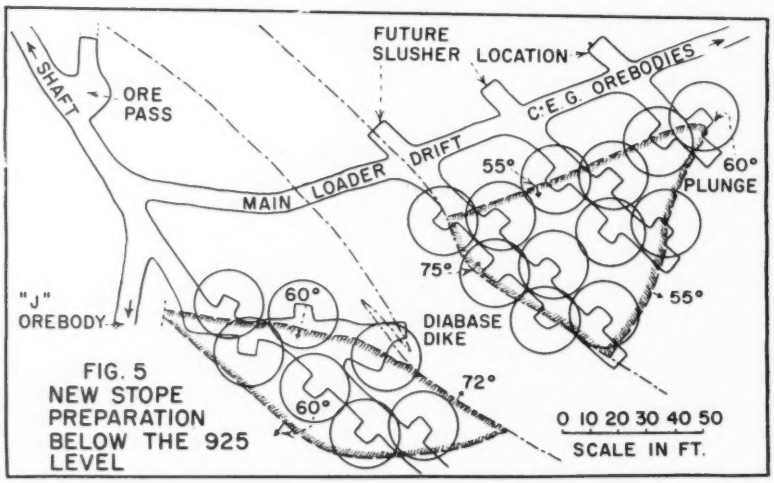
Four standard box-hole layouts are in use depending primarily upon the width of the ore to be mined; and secondly, whether the main loader drift is to be used as a haulage drift for other stopes.

Greatest Pull in Footwall

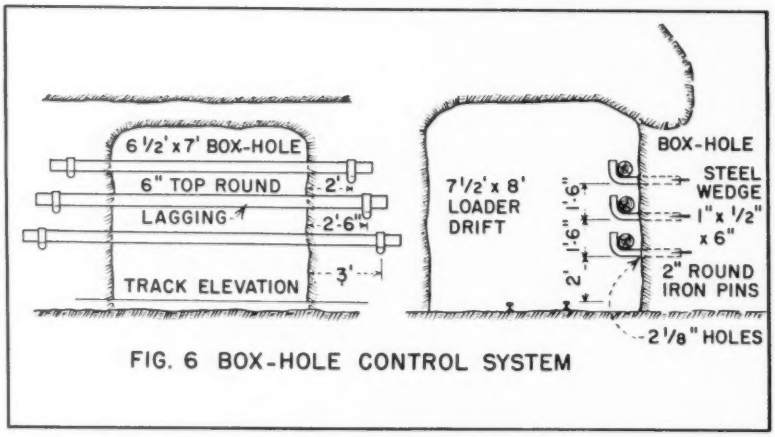
The main fact to be kept in mind when laying out box-holes is that the greatest pull will be on the footwall side of the ore. Sufficient box-holes must be located along the footwall to insure proper distribution of the draw in the stope. As the back height of the stope increases, all the draw will eventually be from these footwall box-holes. If there is a plunge to the ore, as in the case at Renabie, box-holes must be located well under the plunge. The spacing between box-holes must not exceed a maximum of 30 ft. to insure the complete draw of the stope when stoping is completed.



IN VERY WIDE VEINS, 40 ft. or wider, several cross loader drifts are driven from the main loader drift. Box-hole positions are staggered.



IF MAIN LOADER DRIFT will serve several stopes, it is driven in the wall rock 25 ft. under the footwall and parallel to the strike of the ore.



SIMPLE CONTROL GATE of hooks and pole lagging prevents the ore from flowing out of the box-hole and onto the tracks of the adjacent loader drift.

In veins less than 10 ft. in width, the main loader drift is driven in the ore 8 ft. by 8 ft. in section. All drifting is done using a two machine Ingersoll-Rand hydraulic jumbo equipped with DB30 power-feed machines on 4-ft. change aluminum shells. Craig tungsten-carbide tipped drill rods in 4-ft. changes up to 12 ft. are used. The steel is 1-in. Q.O. Atlas "Vibresist." Eight-foot box-hole drift rounds, 6½ x 7 ft. in section, are driven into the footwall

at 25-ft. centers. Box-hole raises, 5 ft. by 6 ft. in section., are driven vertically for three rounds or approximately 18 ft. Raises are coned down to 50 deg. to the footwall and hanging-wall as well as both sides taking ore only. All box-holes are connected by slashing between the cones thus completing the undercut. The manway raise is then driven from the stope sill to the level above for permanent entrance and service. (See Fig. 1).

In veins 10 to 25 ft. in width, the main loader drift is driven in the ore along the hanging-wall and loader drifts are driven into the footwall at 25-ft. centers. These are driven in about 6 ft. past the footwall contact of the ore. Box-hole raises are then driven up in the ends of these loader drifts and coned out in the same manner as in the narrow vein layout. Slashing between the cones completes the undercut. (See Fig. 2).

In orebodies 25 ft. or wider, the main loader drift is driven in the ore along the footwall. If the ore width is 25 to 40 ft., the box-holes are driven on both sides of the main loader drift only. If the ore width is greater than 40 ft., cross loader drifts are driven off the main loader drift at right angles to the strike of the hanging-wall at 45-ft. centers. Box-hole drift rounds are then driven into both sides of the main loader drift at 25-ft. centers and into the walls of the cross loader drifts at 30-ft. centers. The box-holes are staggered along the loader drifts so that no two are opposite each other. Box-holes are raised and coned and the undercut completed. Sill thickness over the drifts is kept at 10 to 12 ft. to simplify sill removal later in the mining cycle. (See Figs. 3 and 4).

Box-Holes in Wall-Rock

When the main loader drift will be required as a haulageway for other stopes, box-holes are driven in the wall-rock 25 ft. under the footwall and parallel to the strike of the ore. Loader drifts are then driven off the main haulage drift at 45-ft. centers through the ore to the hanging-wall. Box-holes are then laid out at 30-ft. centers. This layout is now being adapted on all new levels. (See Fig. 5).

In all the layouts described above, slushers can be used in conjunction with loading ramps for mucking and loading after stoping is completed, and control of the draw is no longer required for mining purposes in the stope. Fifteen-horsepower double-drum air slushers are used with 42-in. hoe-type scrapers and ⅝-in. slusher cable.

While mining is active in the stopes, controls are required on the box-holes in order to stop the flow of muck. The best method of control is the method resulting from the layout used in veins 10 to 25 ft. in width. The muck here is confined to a short box-hole loader drift and cannot spill out over the track in the main loader drift. (See Fig. 2).

As this system is not utilized in the narrow vein or wide orebody layouts, a simple and quick method of stopping the flow of muck from the box-holes must be used. The most effective and cheapest consists of round steel hooks wedged into holes drilled in the loader drift wall on each side of the box-hole, and across these, heavy round lagging is placed to hold the muck. These hooks are made of 2-in. round iron, 30-in. in length and turned up 9 in. at one end. The end which goes into the hole is split for 6 in. to receive a tapered steel wedge 6 in. by 1 in. by ½ in. Holes 2⅛ in. in diameter, three on each side of the box-hole, are drilled into the wall of the loader drift 2 ft., 3½ ft., and 5 ft. above the track. The top holes are 2 ft. from the corner of the box-hole and the center and bottom holes 2½ and 3 ft. respectively. The holes are drilled to sufficient depth to allow a maximum of 9 in. of hook clear of the wall. This prevents bending of the hook. (See Fig. 6).

This method of control has been found to be most satisfactory. The control lagging is easily removed when required by raising one end with the bucket of the mucking machine. If the hooks are installed solidly, no maintenance is required.

Eimco 12-B mucking machines are used exclusively in box-hole mucking. While this type of loading is considerably harder on mucking machines than drift mucking, maintenance cost on mucking machines over the past year has been only 6¢ per ton mucked. Four mucking machines are in use continuously on box-hole loading on three shifts. One spare machine is kept in readiness at all times.

Although short-period electric caps have shown a great improvement in the fragmentation, the numerous slips in the quartz tend to produce some coarse muck and, as a result, some secondary blasting is required. This is done mostly with a plugger or stoper using a small amount of powder to keep gas and smoke at a minimum. All secondary blasting is done at the box-holes.

Wabi type side dump cars of 30 cu. ft. capacity are used in box-hole mucking. Track is 24-in. gage and 20-lb. rail. A grade of 0.5% favoring the load is maintained. As the majority of stopes are located within 300 ft. of the orepass, hand tramming is used to a great extent. However, to speed up these short trams, air locomotives, made in our own shops, are used on the short hauls. These are powered by a 7½-hp. Gardner-Denver air motor and are equipped with a 36-in. by 72-in. air receiver. They are found to be very economical and require little maintenance. Atlas and Mancha 2-ton storage battery locomotives are used with trains of six cars when mucking from the more isolated stopes.

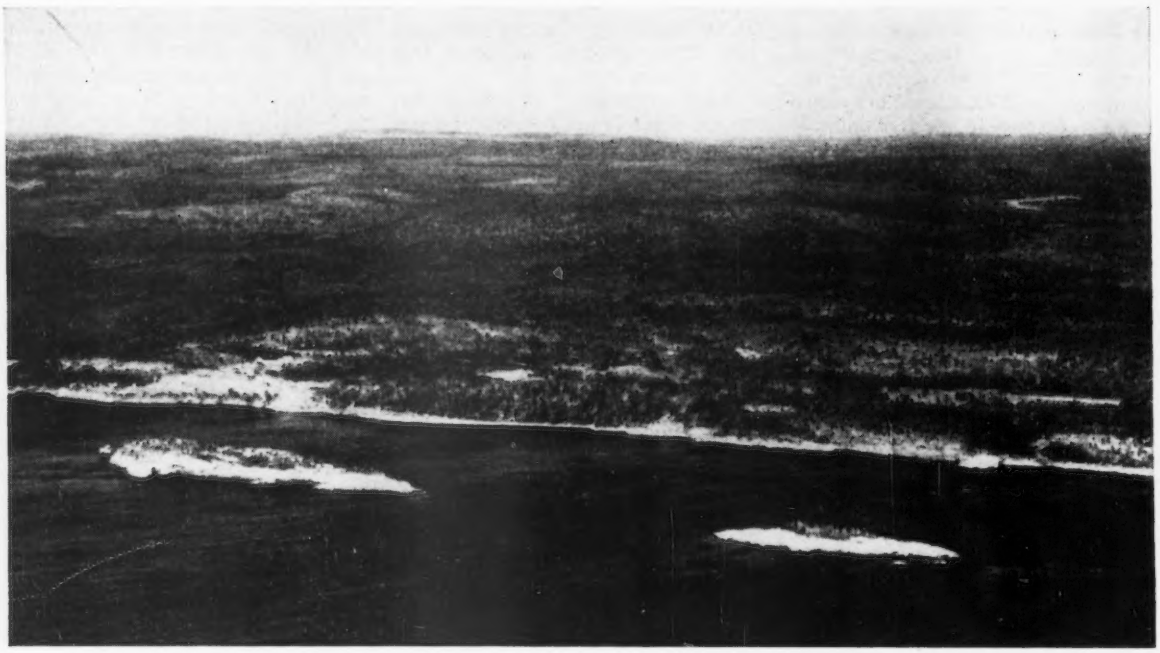
All muck is passed through grizzlies with 12-in. openings to an orepass system connecting all levels. Ore is drawn from three loading pockets and hoisted to a 500-ton storage bin on surface in 2-ton skips.

Plan to Use Larger Loaders

It is proposed to use Eimco 21 mucking machines and 90 cu. ft. Granby type cars on the new levels when loading from large stopes. Air locomotives will be used for tramming. A two-man crew, consisting of a mucking machine operator and a motorman, will be employed. It is expected that the tonnage per manshift will be increased considerably.

This method of mining has been found to be most satisfactory at Renabie. At the inception of mining several years ago, chutes were installed to draw shrinkage stopes. As large fragmentation usually results from blasting in well fractured quartz, considerable secondary blasting was required in the chutes and maintenance costs on the chutes were extremely high. Although maintenance cost on mucking machines has increased as a result of hard usage in box-hole mucking, it has been found to be considerably less than chute maintenance. There is also no hold-up in getting box-holes pulled when required if a mucking machine is used. Considerable time is lost when repair work is required on chutes. A replacement mucking machine can be moved in very quickly.

The writer wishes to express his appreciation to A. A. McCloskey, mine manager, for his helpful comments and suggestions as well as permission to publish the data appearing in this paper.



TWO ISLANDS off Lake Superior's north shore give this locality its name, will provide starting points for constructing Taconite Harbor, terminal for Erie Mining Co.'s 73-mi railroad. Here taconite pellets from Aurora plant will be shipped down the lakes, up-bound coal cargoes for making power and heat will be received.

Erie Ready to Start Work on Big Taconite Project

ELTON HOYT 2d, president of Erie Mining Co. and senior partner of Pickands, Mather & Co. which manages and operates Erie. Of Erie's big project Hoyt says: "This development can be of great importance to Minnesota. It will provide substantial employment . . . Once again Minnesota will have a large reserve supply of iron material which, through the knowledge gained after more than 20 years of pioneering, can be transformed from uselessness into a vital national commodity."

ERIE MINING CO. has completed its plans for financing the initial development of its program for concentrating and pelletizing Mesabi taconite in a plant that will ultimately produce 7½-million tons of pellets annually. Announcement to this effect by Erie's president, Elton Hoyt 2d, on Dec. 4, was the company's first official statement that it definitely intended to proceed with its long considered project.

Eventually a total annual output of 10.5-million tons of pellets per year may be realized from the project, involving an investment of over $300-million. It was for a project of this magnitude that Defense Production Administration in 1952 awarded Erie a certificate of necessity to permit quick amortization of the investment. Erie's taconite reserves are sufficient to take care of the plant's maximum requirements for more than 50 years.

Sale of $207-million of first mortgage 4¼% bonds, due in 1938, to nine insurance companies and Bethlehem Steel Co. has been arranged by Erie. Kuhn, Loeb & Co. handled the sale to the insurance group. Substantial equity capital has also been subscribed by the four companies comprising the Erie ownership, namely, Bethlehem Steel, Youngstown Sheet & Tube, Interlake Iron Corp., and Steel Co. of Canada. These companies participate in the ownership respectively as follows: 45%, 35%, 10% and 10%.

In addition to the new plant, the

project plans call for construction of housing facilities for employees, a standard-gage single-track railroad 73 mi long between the plant and Two Islands, Minn., on Lake Superior's north shore, where pellets will be loaded into lake boats, as well as of the harbor, docks and power plant to be built there.

Taconite Harbor, as the new port will be known, will be about 4,400 ft long and 1,300 ft wide. It will be able to handle the total projected annual production. It will also have facilities for unloading coal brought up the lakes for the new electric power plant, which will generate electricity for the entire project except the townsite. The latter will get its current from existing sources.

All engineering work, including the preparation of plans and specifications, will be done by Anaconda Copper Mining Co.'s engineering department, which Erie has employed for the purpose. The department will also be responsible for construction of the plant.

Experienced With Pellets

When Erie, in 1947, undertook to build its preliminary plant at Aurora, its major purpose was to test the beneficiation process developed at Hibbing with full-size commercial equipment to determine capacities of each unit on the material at hand, and to gain experience on the various cost factors including power consumption, labor requirement, repairs, etc. Up to mid-1952 this was the only taconite plant in existence using commercial-size units. Up to November 1953 it has produced 382,000 gross tons (approximately 62% natural iron) of pellets in addition to 182,000 gross tons of concentrates.

The product has been tested in blast furnaces and open hearths belonging to company stockholders and has been found to be high-grade commercially satisfactory furnace feed.

Mining the Taconite

When large-scale mining starts in the Aurora-Mesaba area, the first pit will be opened within two miles southwest of the plant. A second pit is also projected southeast of the plant. Both will be enlarged as required.

Pre-production stripping of the relatively shallow overburden will be done with large electric shovels and trucks. Taconite faces will be opened by sinking cuts, so that crude ore will be available as the plant calls for it. Subsequent stripping will ensure the adequate supply of taconite at all times.

For breaking ground, Erie has tested jet-piercing, also different types of churn drills and bits, as well as a number of new and improved types of drilling machines. More than one type of drill will probably be used for specific work in the large-scale production.

Large electric shovels also will load the broken taconite into side-dump ore cars on the mine railroad for transport to the primary crushing plant. Other transport methods are under study.

When Milling Starts

The new concentrator accounts for the major part of the total proposed construction expenditure. It will cover an area of approximately one square mile. The site is about 5 mi from Aurora.

It will be the largest ore concentrator ever built, and with one exception, each piece of equipment will be of approximately the same type and size used in the preliminary plant at Aurora. The exception is the primary crusher, which will be much larger than that now used at Aurora.

Initial crushing will be done with gyratories, reducing the taconite to minus 12-in. in the first stage and minus 5-in. in a second stage. Additional stages will reduce it to 2-in. and ⅞-in. size respectively.

From storage the minus ⅞-in. material will be ground in rod mills, then passed over magnetic separators to remove the first tailings, which are to be discarded. Unnecessary grinding will be avoided. Ball mills and cyclones will follow, giving a product 100% minus 100-mesh.

Finishing magnetic separators will raise this product to approximately 64% iron. The final concentrate will represent by weight about one-third of the original taconite. Drum filters will reduce the water content of the concentrate to about 10%.

After filtering, the concentrate will be passed through a rotary balling drum, to roll the fine particles into balls ranging in size from ⅝-in. to 1½-in. The balls will then be pelletized under high temperatures in specially designed shaft-type furnace. It is expected that these furnaces will be heated with fuel oil. Ample storage capacity for this oil will be provided.

Finished product will be shipped to Taconite Harbor, at Two Islands, except during the winter months when the pellets will be stockpiled. On the average, the pellets are expected to run 64% iron, 7.5% silica, and 0.01% phosphorus, with fractional amounts of manganese, alumina, lime and magnesia in addition.

Pellet hardness is an important requirement for the shipping product. Tests have been devised which attempt to duplicate the rough handling which pellets get during loading and unloading at cars, docks and vessels, as well as at the furnaces down the lakes to which the ore will be delivered.

The tailings problem of the 5,250,000-ton plant, involving the disposal of 10,500,000 tons annually of finely ground, high-silica material, has been carefully studied. A 10,000-acre tailings disposal area has been acquired adjacent to the plant site. In cooperation with the University of Minnesota Agricultural Department, a program has been developed for revegetation of the tailings area and restoration of normal growth.

For plant operation some 5,000 gpm of new water will be required after reclaiming as much water as possible through thickeners and settling ponds. To this end the company has acquired a reservoir site in the Partridge Lakes area five miles away and has obtained a State permit to pump 12,000 gpm to the plant for an indefinite period. The reservoir will be created by building two earth dams.

Railroad Will Operate During Shipping Season

The 73-mi railroad between the plant and the harbor at Two Islands will operate during the lake shipping season, which averages 210 days from April to November. Diesel electric power and 90-ton ore cars are expected to be used for handling the taconite concentrates.

This harbor site consists of two islands lying 1,300 ft off the shore and parallel to it. About 4,000 ft of stone breakwater and 1,000 ft of reef capping will be required. Plans also call for a railroad trestle built over a steel-and-concrete bulkhead pier along the shore line, containing a bin for storing pellets. This will discharge through conveyor belts. It will be possible to load lake boats rapidly, inasmuch as the material is free-running and requires no grading. Facilities will also be provided for unloading coal and oil which the lake boats will bring up on the return trip.

No Room for Industrial Complacency

Do you believe that American industry is equipped with remarkably up-to-date and efficient machinery? If you do, you are mistaken. The fact is that a large share of American industry's equipment is ancient, of obsolete design and incapable of attaining the efficiency that is made possible by modern production techniques.

This fact is documented by the Seventh Inventory of Metalworking Equipment, just completed by AMERICAN MACHINIST, a McGraw-Hill publication. In brief, AMERICAN MACHINIST shows that:

1. More than half (56%) of American industry's most basic production equipment—machine tools and metal-forming units—is overage, and much of it is so old that it has very limited usefulness.

2. Since Korea, the situation has become dangerously worse.

Facts vs. Plausible Theory

These conclusions contradict the widely-held impression that America's industrial equipment is in better physical shape than ever before. The prevalence of this impression is not surprising. We, as a nation, have spent about $125 billion for new industrial plant and equipment since World War II. That is more than in any previous period in our history. During 1953, American industry invested $21 billion in new plant and equipment, an all-time high. From this, it would be reasonable to infer that our industrial plant and equipment must be in fine condition.

But the facts do not support that inference with respect to the machine tools and other metalworking equipment that are so crucial to our economy in war and peace. Here are the key findings of the AMERICAN MACHINIST Inventory:

(1) More than one million machine tools—out of a total of less than two million in the metalworking industries—are at least ten years old. Many of these, after day and night operation

during the war years and the recent rush to rearm, are actually much older production-wise than their age in years indicates. In most cases, these machines are unable to produce goods as efficiently as modern equipment can, thus needlessly increasing costs.

(2) Almost one out of five machine tools is more than twenty years old. Most of these machines are so outdated by modern standards that they have little more than scrap value. And an even larger portion of our metal-forming equipment (presses, brakes and shears, bending and straightening machines) has passed the 20-year mark and is beyond normal retirement age.

(3) Two out of three machine tools are of designs predating World War II, though many of them have been built since the war. Thus, two-thirds of our machine tools fail to incorporate the many major postwar improvements in design and operating methods.

(4) Never before has outmoded high-cost equipment been so widely diffused throughout American industry. In every one of fifteen major divisions of metalworking production, more than 45% of the machine tools are at least ten years old.

(5) Not since the depression days of the 1930's has the average age of machine tools risen so rapidly as it has in the past four years. Today, 55% are ten years old or older, compared with 43% just before Korea.

Quality vs. Quantity

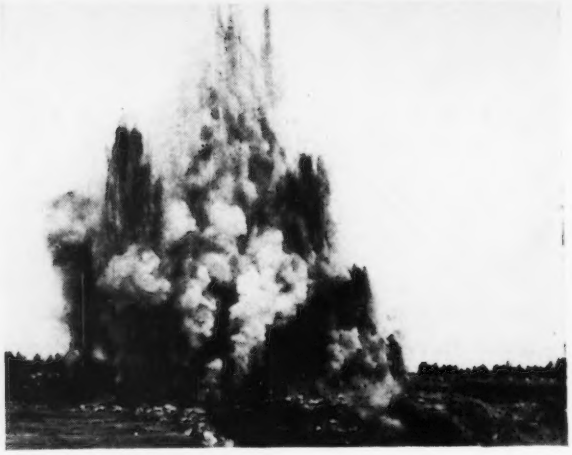
Why has the condition of our metalworking equipment been steadily deteriorating since the end of World War II? Part of the explanation lies in the fact that, in the immediate postwar years, production of metalworking equipment lagged behind the production of industrial equipment generally. The larger part of the explanation, however, lies in the tremendous postwar expansion of the American economy. This expansion, which has more than doubled our total industrial capacity, has imposed requirements for metalworking machinery that have been met only by more extensive use of old and obsolete tools. In the critically important field of metalworking, the job of providing up-to-date tools is bigger than it ever has been.

There are those who argue that the time has come to cut back investment in new industrial plant and equipment and divert more of the national income into current consumption. They cite both the great increase in the nation's total industrial capacity since World War II and the fact that some industries now have more than ample producing capacity to meet their needs. But this type of calculation leaves out the *efficiency* of that producing capacity.

The AMERICAN MACHINIST Inventory makes it manifest that in the key field of metalworking we are alarmingly short of first-rate, low-cost producing capacity. If we fail to remedy this situation by speeding the replacement of obsolete tools, it will be at the peril of our prosperity, at the peril of a sustained increase in our standard of living and of our national security.

McGraw-Hill Publishing Company, Inc.

THE CRUSHER? . . . . . .



OR THE EXPLOSIVE?

Which Is the More Efficient Rock Breaker?

FRED C. BOND
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

THE ABSOLUTE MECHANICAL EFFICIENCY of any method of rock breakage has never been satisfactorily determined. Only relative comparisons are generally accepted, and these have been confined to the different crushing and grinding machines. Since the absolute efficiency of these machines is unknown, it has been variously estimated from a fraction of one percent to above 50%. If the low values are correct it appears likely that the breakage of rock in place by explosives should be more efficient than crushing.

A recent publication by the Bureau of Mines[1] makes such a comparison possible. Taconite iron ore from the Mesabi range near Aurora, Minn., was broken under controlled blasting conditions, and size distribution measurements of the broken products were made.

In one blast 25 cu yd of rock were broken with 0.233 lb of 45% semi-gelatin dynamite per short ton to 80% passing a square hole 2.75 ft, or 839,000 microns, on a side. The 22 largest pieces produced by the blast represented 40% of the total rock broken and had the following average dimensions:

Dimension	"A"	"B"	"C"
Feet	4.48	2.75	1.76
Ratio	1.63	1.00	0.64

"A" represents the largest dimension, "B" is the largest dimension at right angles to "A," and "C" is the largest dimension at right angles to both "A" and "B." "B" represents the approximate square hole size which half of the 22 pieces, or 80% of the total, passes. At an energy content of 900 foot-tons,[2] or 0.678 kwh, per pound of dynamite, the work input "W" is 0.158 kwh per short ton broken.

The work index[3] "Wi" is the kwh per short ton required to reduce from theoretically infinite feed size to 80% passing 100 microns. When "F" is the size in microns 80% of the feed passes, "P" is the size 80% of the product passes, and "W" is the kwh per short ton, "Wi" is found from the equation:

$$Wi = W \left(\frac{\sqrt{F}}{\sqrt{F} - \sqrt{P}}\right) \sqrt{\frac{P}{100}}$$

Substituting gives a blasting work index value "Wi" of 14.5.

The work index in blasting can also be calculated from another set of data.[1] A plotted curve of the pounds of explosive per ton broken versus the percent broken to minus 3 ft ("C" dimension) shows that 0.167 lb of dynamite per short ton breaks to 80% passing 3/0.64 or 4.69 ft "B" dimension, which equals 1,430,000 microns "P." The work input "W" is 0.113 kwh per short ton, equivalent to a work index "Wi" of 13.5.

The average of the two sets of data shows a work index by blasting of 14.0.

Considerable plant and laboratory crushing data on taconite from this district are available, which show an average work index of 16.0. However, this crushing work index represents kwh/ton motor input; when the motor and bearing friction losses are subtracted the work actually applied to the rock in crushing is approximately equal to that applied in blasting when breaking to the same size. In other words, the mechanical efficiencies of breaking by crushing and by blasting are approximately equal.

The amounts of explosive required for breaking different rocks to the same size should be approximately proportional to their work indices, and the work index values can be determined by simple laboratory crushing tests.[3] The increased amount required for breakage to smaller sizes can be calculated by the Third Theory.[3] The drilling speed may be inversely proportional to the work index. The abrasive metal wear and work index increase together, but the exact relationship has not been defined.

Size reduction in an installed crusher costs less than size reduction by explosives, since the cost of a kwh in dynamite is far more than a kwh in electricity. Other factors; including the cost of drilling, and of crusher maintenance and labor, may increase the crusher advantage. However, finer mine or quarry breakage by explosives may decrease the size and cost of a new crusher installation, and thus result in considerable initial saving.

The absolute mechanical efficiency values of breaking rock are still obscure; however, the evidence seems to favor the higher values, since it is difficult to believe that the efficiency of well planned blasting can be less than one percent.

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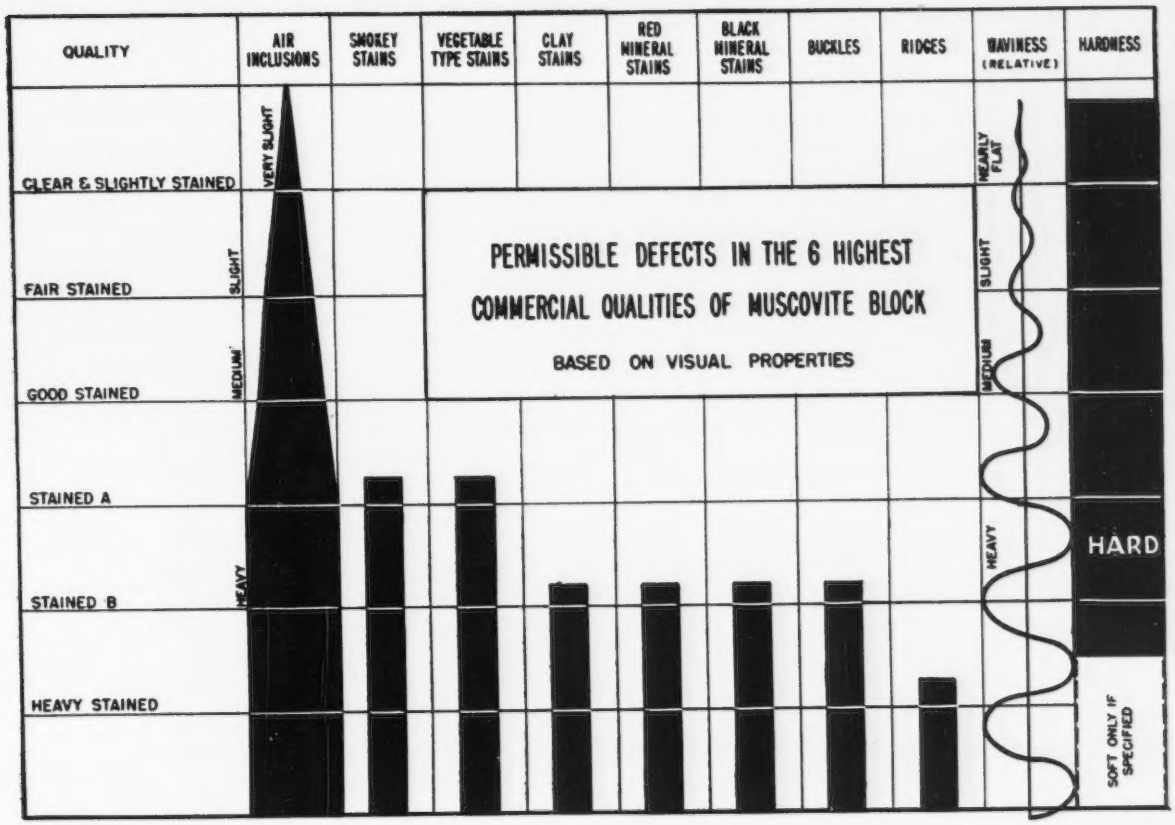
[1] U. S. Bureau of Mines, Report of Investigation 4918, Vernon C. Davis: "Taconite Fragmentation." (June 1953) Fig. 97, Fig. 119, Table 10.

[2] Peele: Mining Engineer's Handbook. (5-16).

[3] Fred C. Bond: The Third Theory of Communication. Trans. AIME Vol. 193, P. 484. (*Mining Engineering*, May 1952).



Charts Simplify Mica Grading Problem

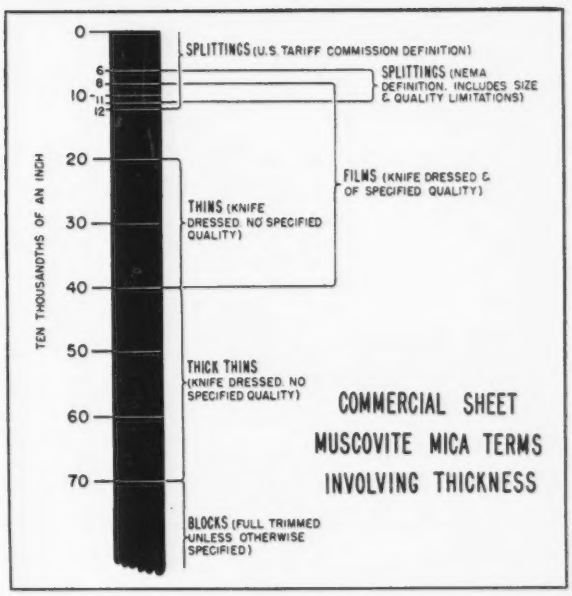
LEROY M. OTIS, Mining Engineer, Muirkirk, Md.

TO ONE UNFAMILIAR WITH MICA terminology, the verbal description of permissible defects in ASTM definitions of block mica quality categories may be confusing. This is particularly true when trying to remember definitions of two or more quality categories as a basis for comparison. The term "quality categories" is used because in mica parlance "quality" denotes a commercial grade, while "grade" denotes a commercial size.

For these reasons, a graphic presentation of permissible defects in the six highest block mica "qualities" is shown here. Three lower qualities are also defined by ASTM, but are of lesser commercial importance, and have therefore been eliminated.

Note in the chart that air inclusions (also called air stains) are the only stains or inclusions permitted in the three highest qualities. These decrease from "very slight" in Clear and Slightly Stained down to "heavy" for Stained A. "Smokey" and "vegetable type" stains are permitted only in Stained A and lower qualities.

Another set of mica terms shown graphically because of their frequent confusion, are the thicknesses involved in the Block, Film and Splittings and in the lesser used categories of "thins" and "thick thins." The terminology is further complicated by the fact that the U. S. Tariff Commission's definition of Splittings differs from that of the National Electrical Manufacturers Association (NEMA), the latter's definition being accepted by the ASTM.



In the case of Blocks, Films, and of Splittings as defined by NEMA, thickness alone does not constitute the entire definition. Size, quality and form of preparation are also limiting factors.

FOR FAST HAULAGE over the 14 km between mine and port, Utah Construction Co. assembled this fleet of 17

DRILLING is done with Joy rotary rigs (left), I-R Quarry-masters, using 7-in. and 5½-in. bits, and I-R wagon drills.

Marcona—Four

FROM A VIRTUALLY uninhabited desert to a large-scale mining operation in less than four months—this is the record established in putting the Marcona iron mine in Peru into production.

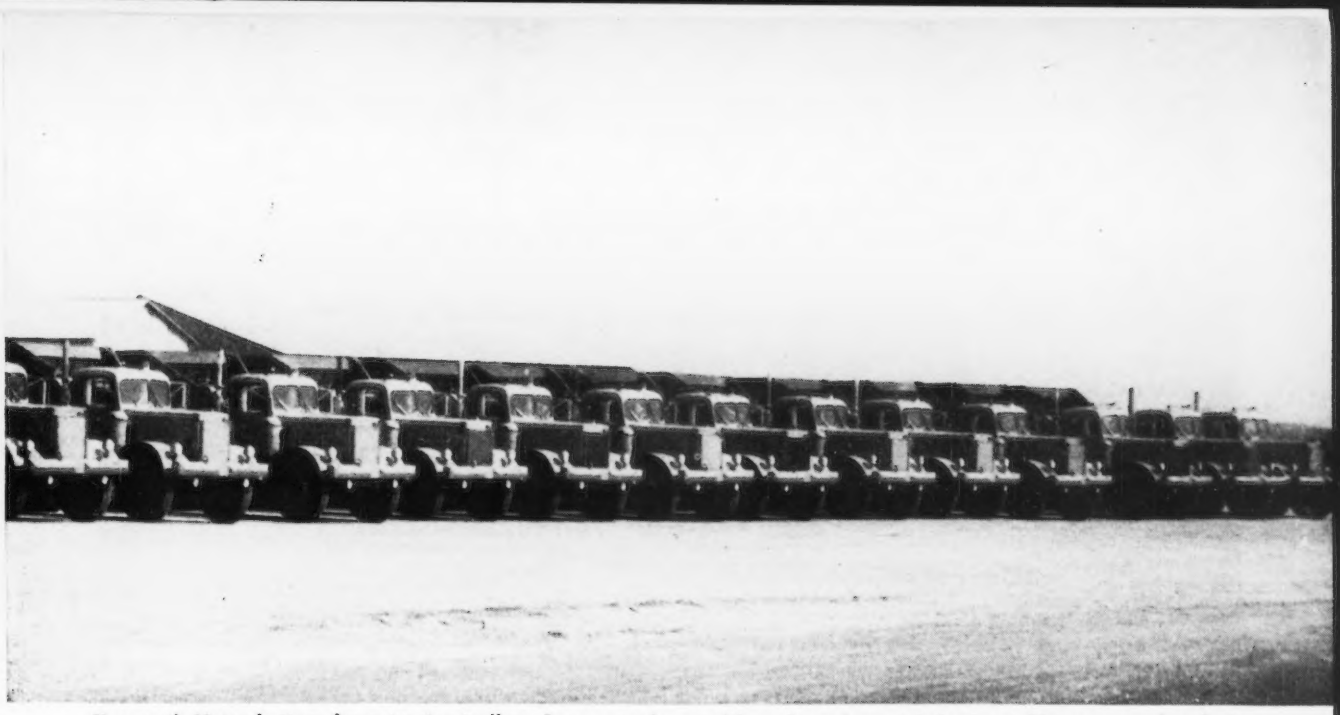
In January 1953, the location of the orebodies in southern Peru was simply a desert waste. Fresh water had to be brought from 60 km away. The present harbor site at San Juan Bay was totally undeveloped.

Despite the handicap of having to bring all the early cargoes of heavy equipment ashore in lighters, and of having to build housing for construction personnel, the crews had the mine in shape by May 7, 1953 to send the first shipment of ore north. By September 1953 an output of 8,000 tons of ore daily had been attained.

This speed record was the accomplishment of Utah Construction Co., which owns the property jointly with Cyprus Mines Corp. Allen D. Christensen of San Francisco is president and general manager of Marcona Mining Co. Henry T. Mudd of Los Angeles is vice-president. Harlan A. Walker is resident general manager for Marcona in Peru.

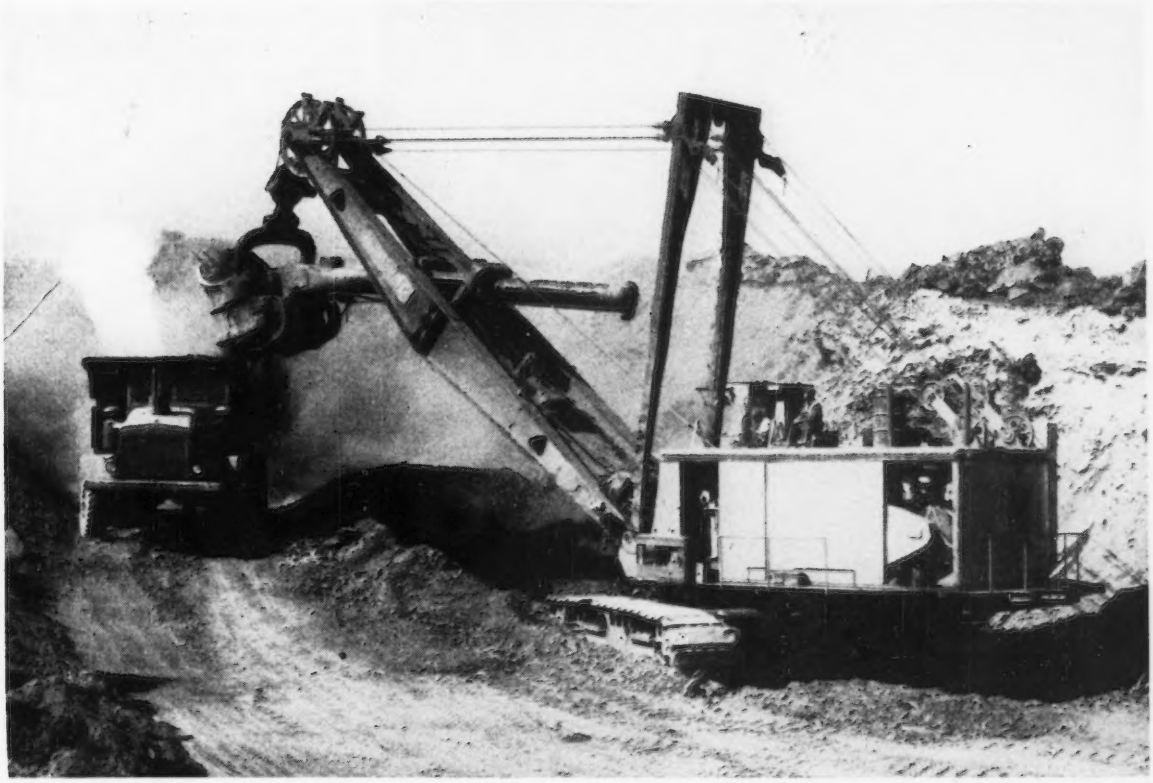
Initial capital outlay for the project exceeded $6-million. The Export-Import Bank recently granted a loan of $2½-million for further mine development and dock facilities.

The Marcona mine lies about 480 km south of Lima in the Department of Ica, about 14 km in from the harbor at San Juan Bay. Corporacion Peruana del Santa, an instrumentality of the Peruvian government, had done some exploration work in the



Kenworth 60-ton bottom-dump tractor-trailers. Long experience with such equipment helped get Marcona moving fast.

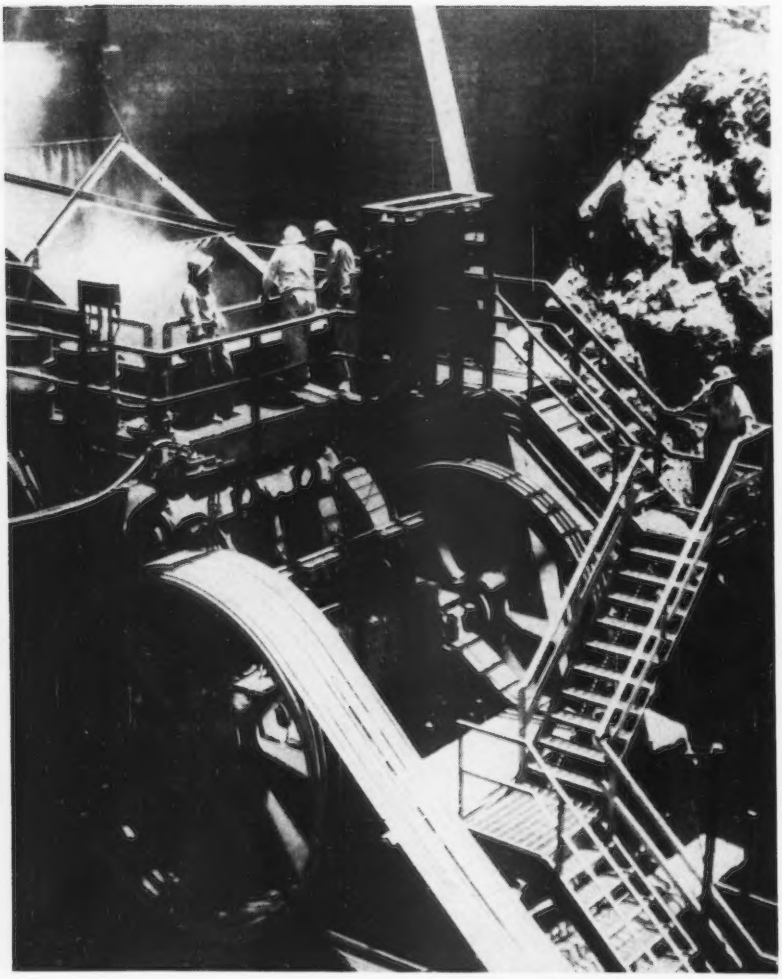
Months From Plan to Production



LOADING employs Manitowoc 6-yd diesel shovels and 34-ton Euclid trucks. Benches are 7 m high, blast holes are spaced from 16 to 20 ft apart and loaded with Atlas powder. Practically no secondary blasting is required. Orebody was outlined by aeromagnetic survey by Aero Service Corp. and drilling begun by Utah in 1951.

FROM THE MINE, shown here, the trucks haul ore to a crusher, from which it is conveyed to a screening plant and a stockpile (background). All this grew from empty barren desert within four months after construction began.

Marcona's Mine—Two-stage haul balanced by stockpiles



region, and in 1951, Utah Construction Co. began active exploration work there under a contract with the Corporacion. By October, a diamond drilling campaign combined with an aeromagnetic survey had outlined orebodies of sufficient size to warrant large-scale mining.

Upon completion of the exploration program, Marcona exercised its option to take over the property for 21 years. This contract was later extended to 30 years. The agreement between Corporacion Peruana del Santa and Marcona covers export of iron ore from the deposits with the stipulation that the company is required to deliver a certain tonnage of iron ore to a steel mill to be constructed at Chimbote in northern Peru. The Peruvian government receives a royalty on the ore exported.

The deposits cover an area of roughly 12x18 mi. Based on the results of present drilling, Utah Construction Co. believes it has in excess of 70-million tons of commercial ore. Present shipments are running over 60% iron.

Happily, the overburden is generally so thin that it can be removed by bulldozers and scrapers. Only occasionally must trucks and shovels be used for stripping. The principal iron mineral is hematite.

CRUSHER, a 66x84-in. Birdsboro-Buchanan, breaks mine-run ore for conveying to plant and stockpiles.

CONVEYOR, a 60-in. Stephens-Adamson, carries ore to screening plant where two triple-deck and two double-deck screens produce sized products according to customers' needs. Movable trippers service stockpile area.

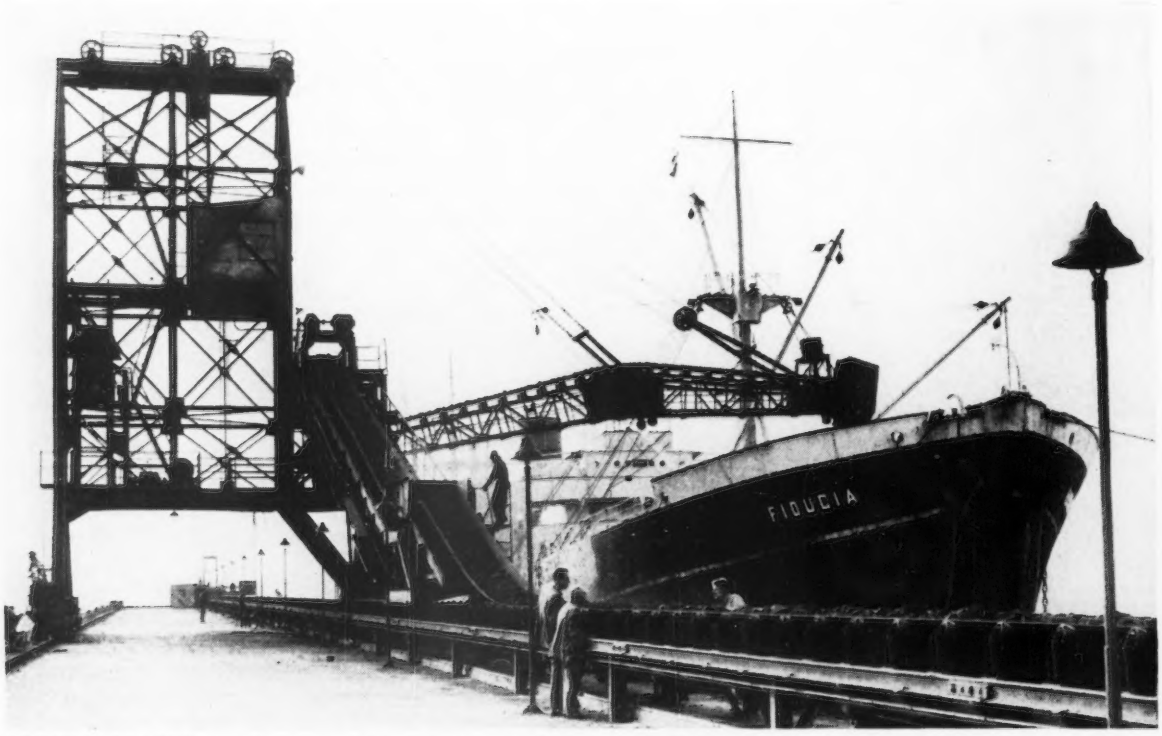
HOPPER where stockpile tunnel conveyor loads trucks hauling to port.

LARGE CAPACITY, fast round trips are objective of 60-ton Kenworth tractor-trailer bottom-dump units hauling ore from mine to San Juan Bay.

CONVEYOR, 36-in., carries ore from the truck dumping point at San Juan Bay up to another screening plant and then out over two stockpile areas located next to dock for loading ships. Tripper on rails controls stockpiling.

FROM PORT STOCKPILES, ore is drawn through a feeder operating in a reclaiming tunnel below stockpiles. A 48-in. conveyor in tunnel leads to transfer tower, connecting with conveyor going to ship-loading gantry.

Marcona's Dock—Smooth loading for the trip



GANTRY LOADER travels up and down docks, and by means of travelling tripper, loads ore at most convenient point. This shipload is going, as is most of Marcona's ore at present, to U. S. Steel's plants near the Atlantic coast.

Increasing quantities of magnetite are met at greater depth.

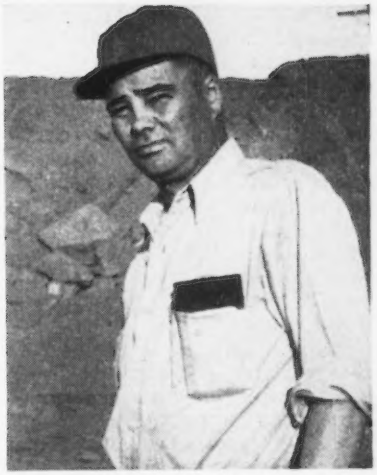
Construction work at the mine and at the dock was done by Utah Company of the Americas, a wholly-owned subsidiary of Utah Construction Co. This work involved: building the crushing, screening, and stockpiling plants; grading and surfacing roads from mine to dock, building a dock at San Juan Bay consisting of 180 ft of rock fill and 760 ft of structural steel H-piling to support the reinforced concrete deck; erecting the truck unloading station and the conveyor system and ship-loading facilities on the dock.

In addition there had to be built power plants, warehouses, repair shops, administration buildings, and housing facilities for all employees.

All of the production is going at present to U. S. Steel Corporation, mainly to plants near Trenton, N. J., and at Birmingham, Ala.

HUGH HARRISON, Pacific Isle's dynamic young president. He early dreamed of operating on his own.

JOHN BOENTJE, general manager, is also responsible for much of Pacific Isle's plant design and construction.



ARNE TUOMALA, as superintendent of mines on Western Mesabi, handles most of company's operations.

Saleable Iron Ore Gleaned From Unmined Remnants

Pacific Isle Mining Co. has won 2-million tons from 7-million tons of crude ores and waste that had been left in 40 properties by previous operators. Starting with a shoestring several years ago, it now runs five beneficiation plants, shares in a sixth.

E. T. BINGER
Secretary
Pacific Isle Mining Co.
Hibbing, Minn.

THE STORY OF PACIFIC ISLE MINING CO. is that of a wartime dream apparently coming true. Hugh Harrison, the company's founder, left his position as district superintendent of Evergreen Mines Co.'s Western Mesabi Range operations for service with the Navy's Seabees in 1944. During his service period the dream of operating on his own behalf was reawakened. He had had a brief taste of individual efforts in 1936, when at the age of 17, aided by his high school football-playing friends, he had loaded by hand and shipped the bottom of an old iron-ore stockpile near Keewatin, Minn., and later loaded out the accumulated iron-ore sample wastings from an old chemical laboratory near Biwabik.

Pacific Isle is not the first organization on Minnesota's Mesabi Range which has sought to produce saleable iron ore from properties that were considered exhausted of commercial ores by previous operators; but it is, perhaps, the only organization which devotes itself almost exclusively to this field of endeavor. Being a latecomer in the industry, it found there were no deposits of ore available for acquisition other than iron-bearing materials wasted or deliberately left unmined by previous operators.

Key Men Have Interest

Hard working, ambitious, and youthful management; self interest at the mine level (thirty-six key employees, many of whom are equipment operators, now have an ownership interest in the company); an increasing demand for its product, which is increasing in value; and generous portions of good luck have held this business together from its shaky start in 1946 to its somewhat less precarious present position. A most important factor has been the finest possible cooperation extended by other mining companies, consumers of iron ore, banks, fee owners, railroads and other third parties.

Six Plants in Operation

Beginning with the dream and a lifetime savings of $2,300, the company has grown from the start. Since its inception it has handled approximately 3,500,000 cu yd of glacial overburden, 500,000 cu yd of waste rock and 3,500,000 tons of crude iron-bearing material to produce about 2,000,000 tons of saleable iron ore. This is the result of individual efforts conducted at 40 different, previously operated, iron-ore properties. One of these properties has actually been exploited by five previous operators.

In 1946, Pacific Isle produced a total of 208 tons of iron ore. In the past year, 1953, it expected to produce and deliver direct to the consuming companies 650,000 tons of iron ore. The hubs of its opera-

tions are the small-scale, modern, ore-beneficiating plants which concentrate the ores found in small quantities in many former high-grade ore properties leased by the company. In 1952 it operated two dry-screening plants, one crushing and screening plant, one washing and screening plant having an installation of Humphreys spirals, and one plant which employs two-stage crushing, washing, high-density separation, jigging and spiral concentration.

In addition to these wholly-owned plants, Pacific Isle owns and operates a modern beneficiating plant in conjunction with E. W. Coons Co., another small Mesabi Range mining company. The latter plant is equipped to handle crude ore material brought to the plant by railroad from the east end of the Mesabi. This plant incorporates two-stage crushing, washing, scrubbing, jigging, use of the Heavy-Media process, and spirals.

BOB CHISOLM (left), superintendent of Mesabi east end mines, gives moral support to A. T. VILLELLA, chief engineer.

DON KEELER is Pacific Isle's treasurer and office manager, graduated from U. of Minnesota's School of Business.

North Uno Mill Flexible

Typical of the modern ore-dressing practices employed by the company is its North Uno concentrator. This plant was erected in 1947 as a simple screening-washing plant to treat a lean-ore stockpile. The original plan was to ship a wash-screened product; but when put into operation, the plant employed a double-deck washing screen, which it had rebuilt from a used single-deck screen. The plus 4-in. size was rejected, the minus 4-in. plus 1-in. was sent to concentrate, and the minus 1-in. material to a rake classifier for washing. Classifier sands went to a horizontal, secondary, double-deck washing screen with a ¼-in. top deck and a 1⅛-in. bottom deck. Later a small screw classifier was added to treat the minus ⅛-in. size. It was then possible to send to concentrate or to reject the minus ¼-in. plus ⅛-in. and the minus ⅛-in. plus 60 mesh classifier overflow depending on the character of the material being treated. This concept of flexibility in plant operation is one that has been carried forward into each new addition and is an extremely important one for treating the widely varying types of materials encountered. It is interesting to know that ore materials from 27 different properties ranging from Grand Rapids, on the west end of the Mesabi, to Virginia 70 mi east have been fed to this plant.

Normally, ore from properties within two miles of the plant are hauled by end-dump trucks, which dump into a 20-ton coarse ore bin; and ores from properties at greater distances are brought in by the Great Northern Railroad in standard 75-ton ore cars. An ore is dumped into a hopper and conveyed to the coarse-ore bin. Ores from each property are treated separately. There is no mixing of either crude ore or concentrates.

The Flowsheet

Crude ore is fed from the bin by a 48-in. x 10-ft Bathke manganese feeder with variable-speed drive onto a double-deck 5 x 12-ft Tyler Ty-Rock washing screen with 4-in. square-opening, punched-plate top deck and 1¼-in. round-opening, punched-plate bottom deck with water sprays.

The plus 4-in. may be sent via a 48-in.x14-ft Pioneer steel-plate feeder to the rock reject truck or across a 10-in. opening grizzly with the plus 10-in. going to the reject feeder. The minus 10-in. plus 4-in. material falls to a 15x36-in. Pioneer jaw crusher for reduction to minus 5-in. The minus 4 in. plus 1¼-in. may be sent by belt conveyor either to the concentrate bin or to the coarse reject stockpile or it may join the jaw crusher product on a conveyor feeding a 54x24-in. Pioneer triple-roll crusher with a discharge setting of 1¼ in.

The crushed product returns to a 4x12-ft Robins Gyrex screen with 2½-in. opening wire cloth from which tramp oversize falls to the reject truck feeder. The screen undersize is carried by conveyor to a 5x14-ft double-deck Simplicity horizontal screen with ⅝-in. opening wire-cloth top deck and ⅜-in. Bixby-Zimmer stainless-steel bottom deck. This screen has three washing troughs built into each deck.

The 1¼-in. material from the Ty-Rock screen falls into an 8-ft Dorr rake classifier. The rake product discharges onto the Simplicity screen and the overflow normally flows to a 16-ft Dorr Hydroseparator, but may be diverted to tailings.

The plus ⅝-in. and plus ⅜-in. sizes, from the latter screen are combined and normally are carried by conveyor to the Heavy-Media plant, but they may be sent directly to either the concentrate conveyor or the coarse reject conveyor.

The Heavy Media Plant

In the Heavy-Media plant, the plus ⅜-in. feed flows with a medium of ferrosilicon and water into a 5x12-ft Hardinge separator, having a variable-speed drive. From this the float product overflows the feed end and the sink product is raked forward and discharges at the front end. These two products discharge onto parallel 3x16-in. Allis-Chalmers Low-head screens with 2-mm opening wedge-slot stainless-steel screens. The first 4-ft of the screens are the drain sections. Medium draining through flows to a sump from which a 4-in. Wemco pump

returns it to the separator. Water sprays wash the remaining medium from the float and sink products which discharge onto the coarse tailings and concentrate conveyors.

The washed medium is pumped by a 4-in. Wemco pump to two parallel 24-in. Dings Crockett Type SF magnetic separators. Cleaned medium falls to a 24-in. Wemco densifier and the tailings go to a 36x36-in. Jeffrey drum separator. The magnetic particles recovered by the drum flow to the densifier and the tailings to the 48-in.x20-ft Wemco classifier. The densifier rake product discharges through a 6-in. demagnetizing coil into the drain sump where it joins the circulating medium.

The specific gravity of separation is varied from 2.8 to 3.3, depending on separating characteristics of the ore, by controlling the amount of water added with the densifier discharge. Control is also effected by sending a greater or lesser portion of medium draining from the float to the medium-cleaning circuit. This is accomplished by positioning a movable trav beneath the float screen.

An electromagnet energized through a relay by the magnetic-separator coil current, will, in case of failure of the magnet current, divert the feed to the separators in the basement so that the ferrosilicon will not be lost.

Three Lines of Jigs

The minus 1/16-in. material from the Simplicity screen flows to a 48 in.x20-ft Wemco classifier. The minus 35-mesh overflow is pumped by an 8x6-in. Allis-Chalmers CWG pump to the Hydroseparator. The minus 35-mesh minus 3/16-in. rake product normally is carried by conveyor to a jig-feed surge bin, but it may be sent to either the concentrate or coarse reject conveyor. From the bin it is fed onto a second conveyor by a 3x8-ft Pioneer plate feeder and discharges into a rotary distributor. The distributor divides the material into three portions; each is sluiced to a line of jigs.

Two lines of 4-cell Pan-American 42x42-in. jigs and one line of two duplex 36x48in. Denver Equipment Co. jigs are provided. Screen beds are 1/4-in. slotted-opening punched-plate in the Pan-American jigs and 6-mm wedge-slot stainless steel on the Deco jigs with 3/8-in. Ni-Hard ball ragging. Both a hutch and a bed concentrate are made and drop to a 60-in.x28-ft Akins classifier for dewatering and discharge to the concentrate conveyor. Tailings flow to a Wemco 36-in.x20-ft duplex classifier for dewatering and discharge onto the coarse reject conveyor.

Most of the overflow from the two dewatering classifiers is pumped by an 8x6-in. Allis-Chalmers CWG pump to the jig steady-head tank for recirculation. Only enough fresh water is added to keep the amount of solids from building up too high.

To the Spirals

The Hydroseparator overflows at approximately 150 mesh to tailings. The underflow, minus 35 mesh plus 150 mesh, is pumped by a 6x6-in. Hydroseal pump to two standpipe splitters which feed 39 five-turn Humphreys spirals. A final tailing is made, a middling that returns to the Hydroseparator by gravity, and a concentrate. The concentrate from each group of three primary spirals is split to feed two of the 24 three-turn secondary spirals. The tailings from the secondaries return to the Hydroseparator by gravity. The concentrate is pumped by a 4-in. Nagle pump to the 60-in. Akins concentrate-dewatering classifier.

The spiral tailings and Hydroseparator overflow are piped to a 10-in. Pettibone Mulliken tailings pump, which sends them through 4,500 ft of 14-in. spiral-welded pipe to the tailings pond.

All coarse rejects other than plus 4-in. materials, which are truck-hauled to waste dumps, are carried by conveyor to a 40-ton bin from which they may be loaded into trucks for disposal or diverted to a stockpiling conveyor system.

All concentrates are carried by conveyor to a 60-ton concentrate-loading bin from which they are loaded into railroad cars. Provision has been made to allow Heavy Media concentrates to be carried to a separate concentrate bin, so that shipments of plus 3/16 in. concentrate may be made if desired. Concentrates may be stockpiled by trucking from the bins to a stockpile ground.

Some Plant Data

Approximately 3500-gpm of plant water is pumped from the tailings pond by an 8x10-in. Peerless pump through 6,200 ft of 16-in. spiral-welded pipe. Total electric power used averages 750 hp. There is 140 ft of 30-in. belt conveyor and 1,680 ft of 24-in. installed in the plant.

During the 1952 season, the average rate of feed to the concentrator was 167 long tons per hour. Concentrate recovery was at the rate of 68 long tons per hour for an average weight recovery of 41%.

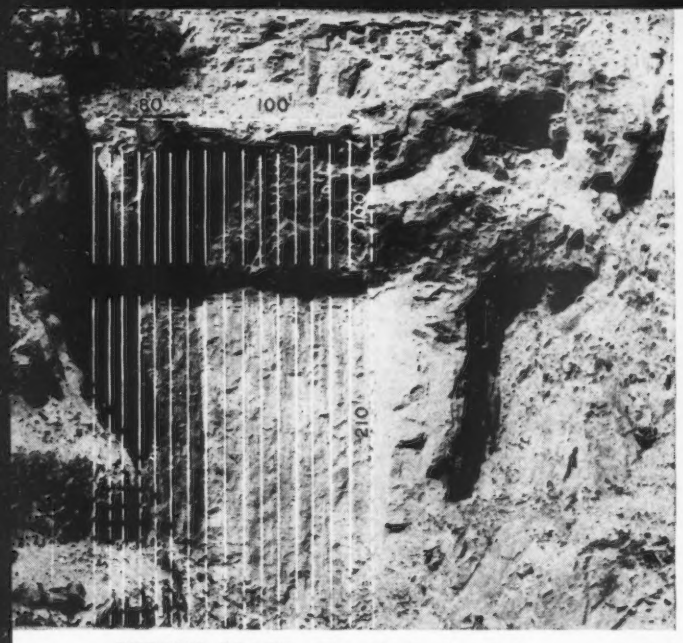
At any one time the beneficiation facilities of the company are supplied with crude-ore material produced by five company mining organizations and one or two properties operated by third parties on a contract basis.

Equipment used in company mining operations includes typical 3/4- to 3 1/2-yd diesel-powered, crawler-type shovels; 15- to 22-ton capacity diesel-powered end-dump haulage units; crawler tractors with bulldozer attachments; cyclone drills; and diesel-powered road patrols.

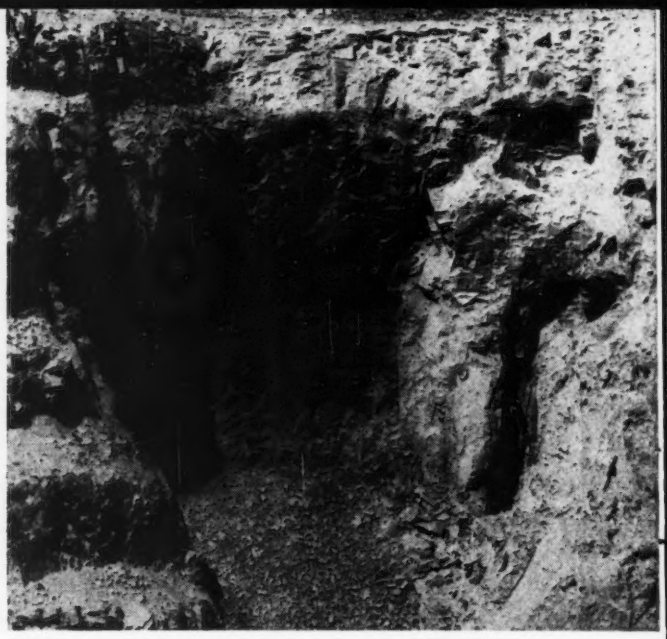
Small dipper capacity is often necessary in operating these "scram" properties to enable the shovel operator to do a job of selective mining which is a most important phase of this type of operation.

Management Is Young

This organization depends heavily upon the rather young management personnel which 34-year-old Hugh Harrison has attracted to the organization during its short life. Many of these men are also veterans of World War 2; a few of them are named specifically here. John Boentje, a veteran, is responsible for most of the company's plant design and construction as well as for supervising much of the company's mining activity. He is 36 years old and a graduate of the University of Washington School of Mines. His experience includes underground mining in the West as well as a period of lecturing at the School of Mines at the University of Utah. Arne Tuomala, superintendent of a majority of the operations, is 39 years old and has worked in and about the mines of the Mesabi Range since about 1932. Bob Chisholm, another veteran, is another mining superintendent, is 33 years old and a graduate of Dartmouth College, where he majored in geology. Tom Binger, also a veteran, is 30 years old, a graduate of the University of Minnesota School of Law, is the secretary and legal counsel of the company. Don Keeler, 38 years old, and a graduate of the University of Minnesota School of Business, is treasurer and office manager, having been with the company since its first year of actual operations, 1946.



BEFORE BLAST. The 210-ft down-holes were drilled vertically. The 100-ft up-holes at 65 deg to horizontal to leave brow. The 80-ft section on left wall is a pillar.



AFTER BLAST. Muck pile in foreground shows the uniform good fragmentation obtained by the blast. Large slabs at right were shaken off the pillar.

How Cananea Gets Good Fragmentation

On June 21, 1953, Cananea Consolidated Copper Co., Sonora, Mexico blasted more than 81,000 tons of rock with 10.2 tons of powder to remove ore left in the wall of the Colorado open pit. Technical details of the blast are presented here.

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Assistant Mine Superintendent, Cananea Consolidated Copper Co.

THE ORE EXTENDED HORIZONTALLY into the hill which formed the south wall of the open pit, but to mine the ore by open pit methods would have been uneconomical because of the high waste-to-ore ratio. Instead, the ore is being mined underground by blast-hole, diamond drill methods. The stopes were started from the benches of the open pit and are now being extended horizontally into the hill. These stopes are normally about 226 ft high and 80 ft wide, but in the case of the blast to be described, the stope was 320 ft high and 182 ft wide.

A plan (Fig. 1) and a section (Fig. 2) show the type of drilling room used for this blast. The room was cut 10 ft wide, 11 ft high, and 182 ft long by the use of mounted machines and scraper mucking. Work on opposite ends of the room was started simultaneously. About 100 man-shifts were needed to drive this room. A 12-ft pillar was left between the room and the outside. This room was parallel to the blasting face whereas the drilling rooms used at Cananea are normally perpendicular to the face.

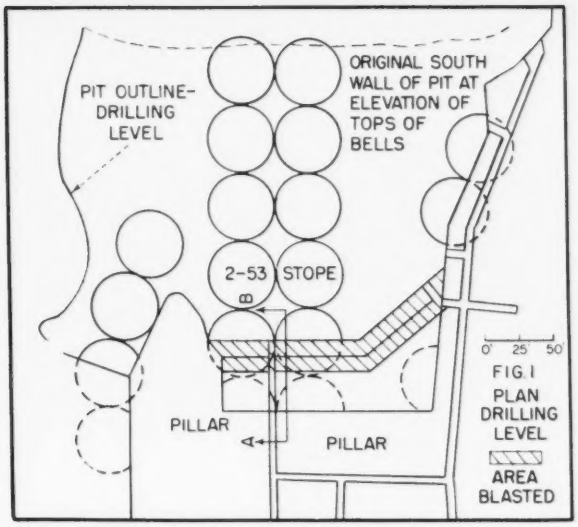
Summary of Data

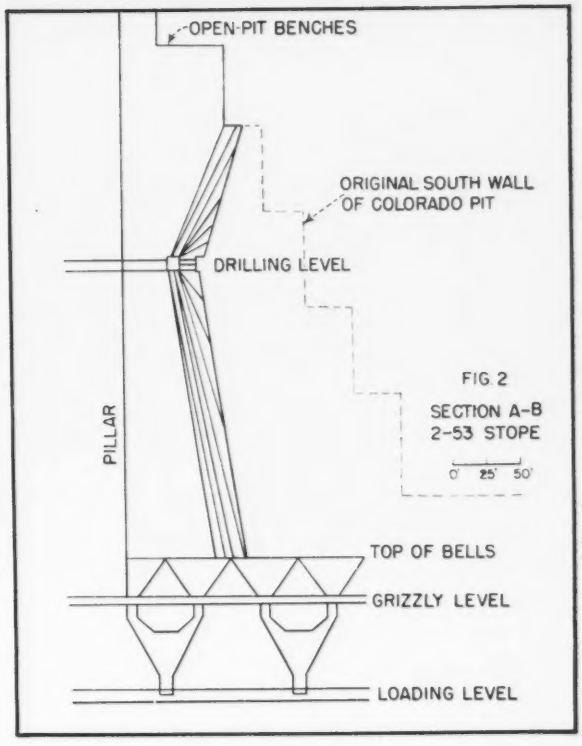
Tons blasted:	81,739
Line of holes:	14
Number of holes:	313
Feet of holes drilled:	31,672—EX bit
Average depth of hole:	101
Tons broken per ft of hole:	2.6
Feet of burden:	7 at bottom of hole
Feet of spacing:	8
Diamond drill machine shifts:	366
Average footage per machine shift:	87
Tons of powder:	10.2—12-in. 80% semi-gelatin
Feet of Primacord:	32,198
Pounds of powder per foot of hole:	0.64
Pounds of powder per ton broken:	0.25
Voltage used:	220 ac—60 cycle
Voltage needed:	160
Amperage needed:	21
Power needed:	3360 watts
Power used:	5-kw transformer

As soon as the room was completed, diamond drilling was started with Chicago Pneumatic number five machines and EX bits. Back holes were drilled first and then holes in the floor. In the floor, holes were collared with an AX bit for the first foot and a half. Then a two-foot length of one and 1½-in. pipe was forced into the hole to keep the collar clean and prevent caving. The hole was then continued with an EX bit. Holes in the back were drilled in the same manner, but no pipes were inserted. At some places, larger holes were necessary to lessen the amount of water running over the machine men.

Holes in the back were usually not drilled over 100 ft in length, while those in the floor were drilled to connect or 215 ft in depth. The rock was excellent for drilling and no holes were lost. Average rate of drilling for this round was 87 ft per machine shift.

When drilling was completed, down holes were checked with a wooden-pointed brass tamping block lowered on a sash cord. Up holes were checked with a length of plastic hose. Bad holes were then redrilled or cleaned with a chopping





FIGS. 1 and 2. Plan and section of the stope being mined in the wall of the open pit mine at Cananea. Note position of up and down holes from intermediate drilling level.

in Large Blasts

bit, and then loading was started.

Only 12-in sticks of 80% semigelatin dynamite were used to load the blast holes. Back holes were loaded first. A stick of powder was threaded on Primacord and forced up the holes with a plastic loading hose. Successive sticks of powder were then tamped in the same manner.

Down holes were loaded with a tamping block. In holes over 100 ft the powder was tamped every 20 sticks. When the holes were less than 100 ft, the powder was tamped every 10 sticks; and when less than 50 ft, every 5 sticks. In all the holes, Primacord was run the full length of the hole.

All holes except those in the line fired with the last delay were loaded to within 6 ft of the collar. Holes in the line with the last delay were loaded almost to the collar. This was done to prevent misfires caused by a hole firing first and cutting off a hole with a later delay.

The usual method of attaching millisecond delay caps to Primacord with friction tape was not well suited for use with closely spaced holes. In previous blasts, misfires were caused by the lower numbered delays firing first and tearing the higher numbered delays from the Primacord before the caps had a chance to fire. Although the caps probably fired, they fired in the air and did not detonate the loaded hole.

To prevent this type of misfire when the holes were close together, the caps were placed in a stick of powder and loaded in the hole with two or three sticks of powder tamped above the primer. The leg wires were then either tied with a double half hitch around the collaring pipe, or a wooden wedge was driven into the hole and the leg wires were attached to the wedge. About 113 manshifts were used to load this round.

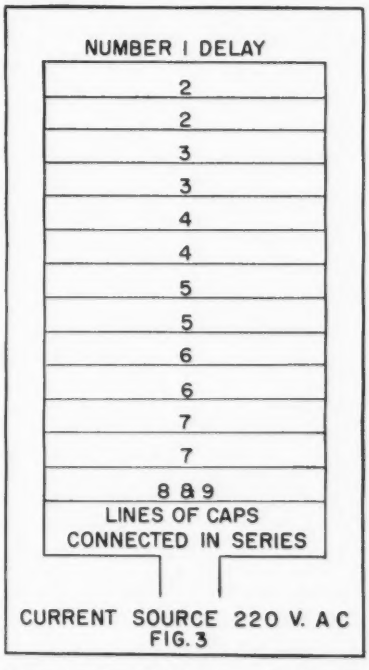


FIG. 3. Parallel-Series circuit used to detonate 313 holes in blast.

In previous blasts the caps were connected in parallel when under 50 holes were to be fired at one time. A parallel series circuit was used if over 50 caps were to be fired. The latter type of parallel series circuit (Fig. 3) was used in this last blast of 313 holes. When the caps were connected, all delay tag numbers were left on the wires for ease in later checking the circuit. When the holes were blasted in this parallel series, a cord was run down each side of the room to support the leg wires. This left a working path down the center of the room. Only caps of one delay were connected in any one series except in the last line where the corner holes with No. 9 delays were connected in series with the No. 8 delays. In some of the other blasts, all lines were balanced by adding caps if necessary to make the same number of caps in each line. This method was modified so that, in this blast, if the line with least number of caps did not vary over 25% from the line with the most number of caps, no caps were added.

In a previous blast of 68,000 tons from this face, the millisecond delays were connected as in Fig. 4.

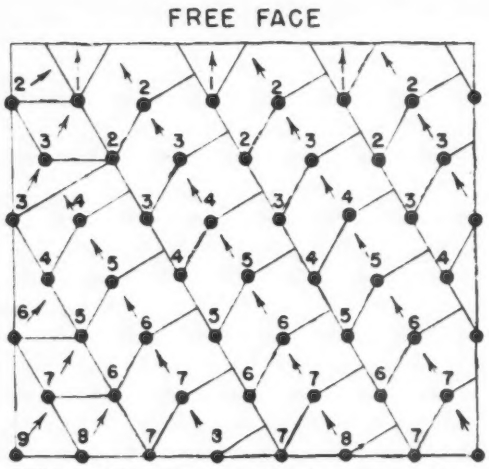


FIG. 4. Detonating pattern in previous blast gave poor fragmentation.

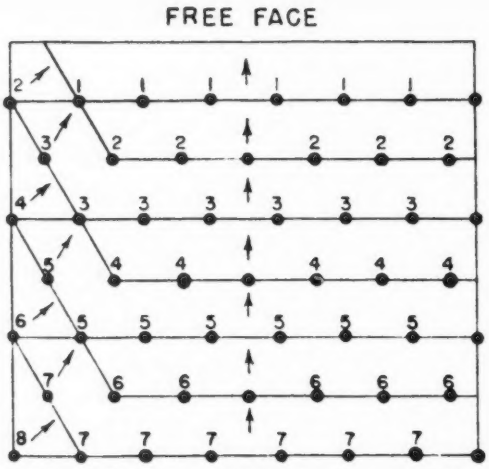


FIG. 5. "Crisscross slabbing" was responsible for good fragmentation in blast on June 21.

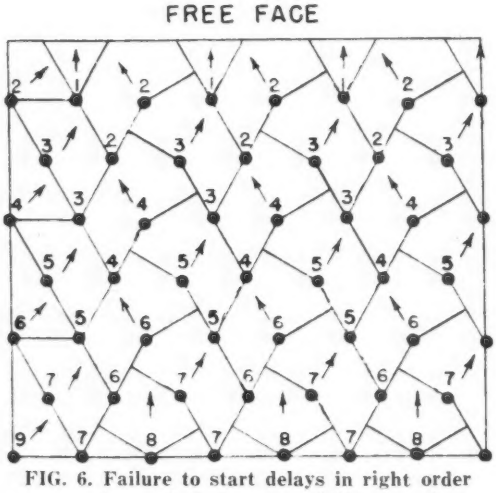


FIG. 6. Failure to start delays in right order causes loss of "crisscross slabbing" effect.

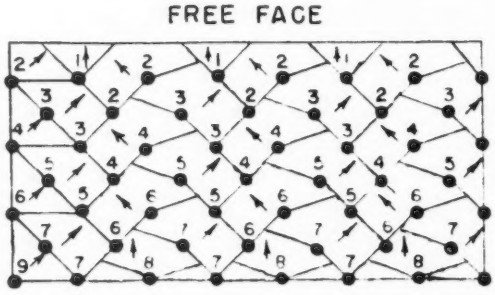


FIG. 7. Theoretically this would give best fragmentation, but is not suited for Cananea.

● DRILL HOLE WITH NUMBER OF DELAY
← DIRECTION OF ROCK MOVEMENT
— LINE OF BREAKAGE

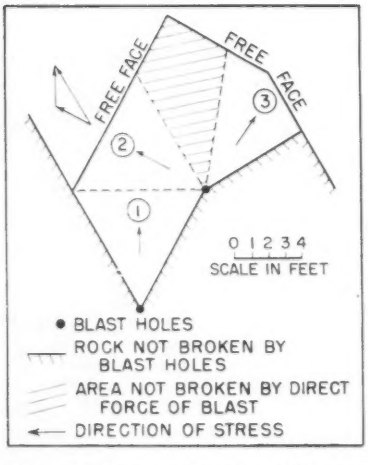


FIG. 8. How "crisscross slabbing" gives better fragmentation.

The round broke but with only fair fragmentation. The same burden and spacing of 7 and 8 ft respectively were used in this last blast; however, it was fired with the use of the millisecond delays shown in Fig. 5. Much better fragmentation was obtained with this system of delays.

This system differs from the usual in that, in this series, each successive line uses only one higher number of delay than in the previous line. Only in the extreme corners was a higher numbered delay used to clean the corners. With the better fragmentation, the only large boulders that could be seen on the surface were boulders that caved from a pillar between two stopes. Further evidence of better rock fragmentation in its entirety was shown by the fact that the outline of the drawing bells could be seen on the surface a week after the blast. Previously, the bells would not outline themselves as quickly because large boulders would hang up and prevent even drawing of the muck.

Better fragmentation was probably obtained because the rock was not only put under stress the same as in the normal one-two sequence firing of millisecond delays, but also because the holes fired in a series of two-hole slab shots where each slab shot was stressed and fired in one direction and immediately stressed and hit at almost a right angle. This slabbing action in the actual interior of the blast seemed to be the main reason the rock

(Continued on page 166)

Differential Grinding in Cyclone Shown by Screen Tests

Results with Mesabi intermediate ore before and after passing through 6-in. unit show definite effect

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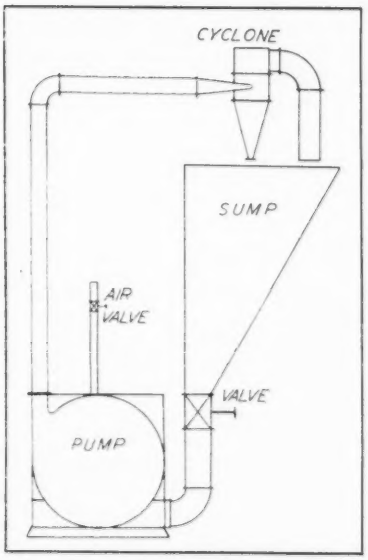
DURING SEVERAL YEARS PAST a big and growing interest has been evident in the use of liquid cyclones in mineral beneficiation. That there are a number of different applications for cyclones has been well recognized. These are: for thickening, for desliming, and for concentration using a medium to increase the fluid specific gravity. Each has been described several times in technical journals and consequently there is a considerable body of literature on the use of liquid-type cyclones in mineral treatment processes.

In all this mass of technical data on cyclones, however, no mention has been made of a peculiar phenomenon and possible cyclone application that has been observed in

(*Continued on page 168*)



BATCH TESTS for differential grinding were made in 6-in. cyclone set-up, as illustrated here, with pump and sump.

TABLE 1. Screen Analyses of Head Sample

Mesh Size	% Wt.	% Iron	% Silica	Cumulative % Wt.	Cumulative % Iron	Cumulative % Silica	% Recovery Iron	% Recovery Silica
+ 6	7.53	56.56	12.35	7.53	56.56	12.35	8.16	4.83
+ 8	11.88	55.83	13.50	19.41	56.11	13.05	20.86	13.16
+ 10	10.61	55.11	14.64	30.02	55.76	13.61	32.06	21.23
+ 14	9.82	54.22	15.04	39.84	55.38	13.97	42.26	28.90
+ 20	9.29	53.10	17.60	49.13	54.95	14.65	51.71	37.40
+ 28	10.37	51.49	18.36	59.50	54.35	15.30	61.93	47.29
+ 35	11.64	51.89	18.85	71.14	53.94	15.88	73.50	58.69
+ 48	11.02	55.03	15.00	82.16	54.09	15.76	85.12	67.27
+ 65	6.48	58.16	12.51	88.64	54.39	15.52	92.33	71.48
+100	4.00	56.31	15.50	92.64	54.47	15.52	96.65	74.70
−100	7.36	23.76	66.16					
Total	100.00	52.21	19.25					

TABLE 2. Tests on Cyclone for Differential Grinding

Test No.	Mesh Size	% Wt.	% Iron	% Silica	Cumulative % Wt.	Cumulative % Iron	Cumulative % Silica	% Recovery Iron	% Recovery Silica
20	+ 6	3.89	58.41	9.77	3.89	58.41	9.77	4.35	1.97
	+ 8	8.90	59.30	8.48	12.79	59.03	8.87	14.46	5.90
	+ 10	9.45	59.14	8.86	22.24	59.08	8.87	25.16	10.24
	+ 14	9.24	59.30	8.61	31.48	59.14	8.79	35.66	14.38
	+ 20	8.16	57.37	10.08	39.64	58.78	9.06	44.63	18.65
	+ 28	8.01	56.32	12.05	47.65	58.36	9.56	53.27	23.66
	+ 35	8.56	55.36	12.37	56.21	57.91	9.99	62.34	29.16
	+ 48	9.71	57.13	10.40	65.92	57.79	10.05	72.97	34.41
	+ 65	6.68	59.62	8.53	72.60	57.96	9.91	80.59	37.37
	+100	5.40	59.45	9.48	78.00	58.06	9.88	86.74	40.03
	−100	22.00	31.46	52.47					
	Total	100.00	52.21	19.25					

Notes: Calculated number of passes through cyclone was five times. Pressure was 20 psi. Density of cyclone feed was 2.3.

22	+ 6	3.22	60.19	8.13	3.22	60.19	8.13	3.71	1.36
	+ 8	8.12	60.02	8.13	11.34	60.07	8.13	13.05	4.79
	+ 10	9.29	59.86	7.70	20.63	59.97	7.94	23.70	8.51
	+ 14	9.00	59.06	8.64	29.63	59.70	8.15	33.88	12.54
	+ 20	8.23	58.26	9.66	37.86	59.38	8.48	43.06	16.67
	+ 28	7.42	56.65	11.37	45.28	58.94	8.95	51.11	21.06
	+ 35	8.08	55.53	12.10	53.36	58.42	9.43	59.71	26.14
	+ 48	8.93	56.81	10.50	62.29	58.19	9.58	69.42	31.01
	+ 65	6.81	59.38	8.37	69.10	58.31	9.46	77.17	33.97
	+100	6.16	59.22	9.54	75.26	58.38	9.47	84.15	37.02
	−100	24.74	33.44	49.00					
	Total	100.00	52.21	19.25					

Notes: Calculated number of passes through cyclone was ten times. Pressure was 20 psi. Density of cylcone feed was 2.3.

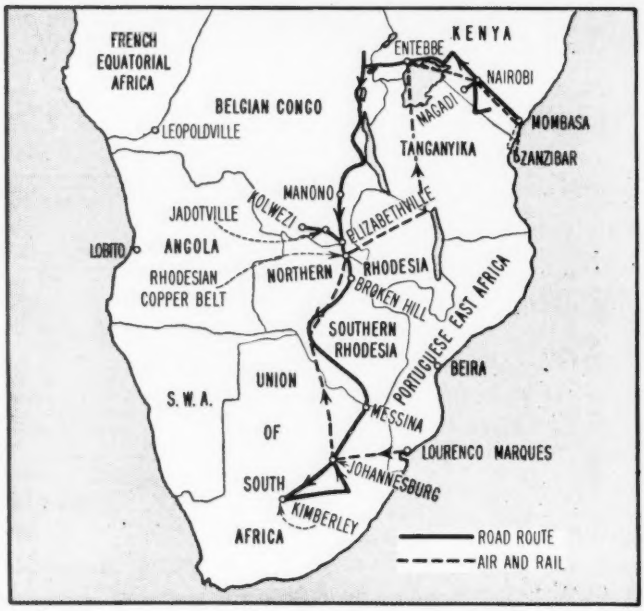
TABLE 3. Standard Test with Ball Mill for Abrasion Milling

Test No.	Mesh Size	% Wt.	% Iron	% Silica	Cumulative % Wt.	Cumulative % Iron	Cumulative % Silica	% Recovery Iron	% Recovery Silica
28	+ 6	—			—				
	+ 8	3.86	61.70	6.04	3.86	61.70	6.04	4.56	1.21
	+ 10	2.90	62.51	5.37	6.76	62.05	5.75	8.03	2.02
	+ 14	4.36	61.94	6.21	11.12	62.01	5.93	13.21	3.43
	+ 20	7.14	59.28	8.38	18.26	60.94	6.89	21.31	6.54
	+ 28	10.13	56.63	12.07	28.39	59.40	8.74	32.30	12.89
	+ 35	13.49	54.77	13.69	41.88	57.91	10.33	46.45	22.48
	+ 48	18.01	55.90	13.58	59.89	57.31	11.31	65.73	35.19
	+ 65	8.98	57.51	12.38	68.87	57.33	11.45	75.63	40.96
	+100	7.40	55.98	14.45	76.27	57.20	11.74	83.56	46.52
	−100	23.73	36.17	43.39					
	Total	100.00	52.21	19.25					

TABLE 4. Pump and Pipeline Test

Test No.	Mesh Size	% Wt.	% Iron	% Silica	Cumulative % Wt.	Cumulative % Iron	Cumulative % Silica	% Recovery Iron	% Recovery Silica
33	+ 6	7.12	57.05	11.60	7.12	57.05	11.60	7.78	4.29
	+ 8	11.74	56.81	13.39	18.86	56.90	12.71	20.55	12.46
	+ 10	10.35	55.76	13.86	29.21	56.50	13.12	31.61	19.91
	+ 14	9.08	54.31	14.28	38.29	55.98	13.40	41.05	26.64
	+ 20	8.82	53.51	17.50	47.11	55.52	14.16	50.09	34.66
	+ 28	9.98	51.49	17.75	57.09	54.81	14.79	59.93	43.86
	+ 35	11.31	52.28	17.87	68.40	54.39	15.30	71.26	54.36
	+ 48	10.94	55.92	14.80	79.34	54.60	15.23	82.98	62.78
	+ 65	5.77	60.06	10.17	85.11	54.97	14.89	89.61	65.82
	+100	3.38	56.47	13.49	88.49	55.03	14.83	93.27	68.19
	−100	11.51	30.52	53.20					
	Total	100.00	52.21	19.25					

Note: Calculated number of passes through pump and pipeline was five times.



LEO A. LYONS, Australian metallurgist, takes off by car for a four-months' tour of major African smelters, refineries, and concentrators. Map shows areas visited. This article reports some of his observations.

Australian Metallurgist Reports

Mr. Lyons, well-known Australian metallurgist, and his wife made a five-month's tour of African metallurgical plants including smelters, refineries, leaching plants, and concentrators. The article which follows represents the type of practical observations a skilled smelterman would make on such a tour. Some 9,000 miles were covered by automobile, after which much of the same route was retraced by plane and ship. A number of plants visited by Mr. Lyons, but described in other recent articles in *E&MJ*, are not included here.[1] See map showing scope of tour.

L. A. LYONS, A.S.T.C., A.A.C.I., A.R.P.S.

TECHNOLOGICAL IMPROVEMENT and expansion appears to be a common keynote everywhere in Africa's great mining and metallurgical centers and these activities are reported in a more or less chronological sequence. It is important to note at the outset that a diversity of measurement systems was encountered on the trip, hence all weights will be expressed in long tons unless otherwise stated.

Kenya. A call at the Mines Department, Nairobi, confirmed that Kenya is not an important mineral producer. Some optimism is felt that the country's huge deposits of flake graphite will be successfully utilized to yield a product conforming to highest world standards, and Kenya may rival Madagascar as the principle source.

A detour was made to Lake Magadi, salt lake in the Great Rift Valley of Africa, 70 mi from Nairobi. The Magadi Soda Co. dredges a 30-sq mi deposit of trona (sodium sesquicarbonate: $Na_2CO_3 . NaHCO_3 . 2H_2O$), coverting it in rotary kilns to first quality soda ash at a rate of 130-140,000 tons per year. Twenty thousand tons of common salt are also produced.

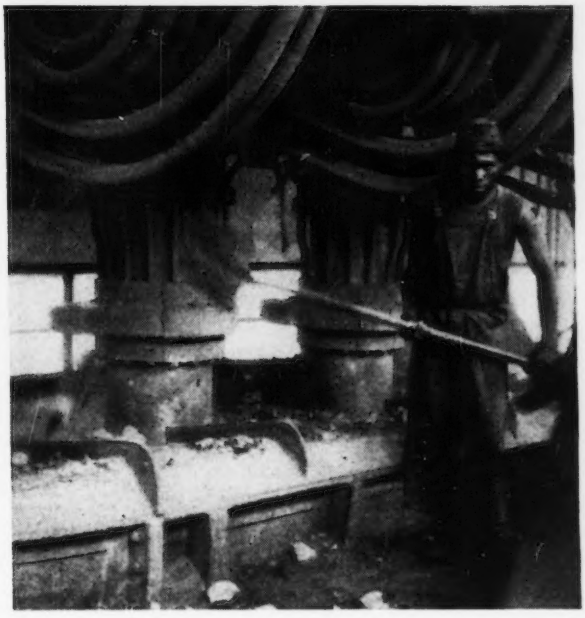
Uganda. The Mines Department at Entebbe reported that the only item of major metallurgical interest is Kilembe Copper Mines Ltd's. copper-cobalt property. This resembles some of the Rhodesian deposits. Progress with the Owen Falls hydroelectric scheme at the source of the River Nile, near Jinja, opens up interesting possibilities for Kilembe. Frobisher, Ltd. is now arranging project financing.

Belgian Congo

Important factors common to all Congo metal producers are: (a) Abundance of cheap hydroelectric resources. (b) Vast distances over which incoming supplies and outgoing products must be freighted. (c) Comparative abundance of cheap native labor

Compagnie Géologique et Miniére des Ingénieurs et des Industriels Belges (Géomines). "Géomines" was the first plant of major importance visited in the Congo. It is an important tin producer, located at Manono, 2,000 ft above sea-level. Matters of special interest are: (a) Difficulties encountered in mining hard pegmatite, host rock for cassiterite. (b) Recovery of tantalite-columbite. (c) Electric smelting of tin concentrate, with production of very pure metal.

[1] How Northern Rhodesia Meets Rising Base Metal Demands by Talbot and Chapman, *E&MJ* August 1953, Pp 82-87.



THREE-PHASE ELECTRIC FURNACE smelts cobalt-copper materials at Panda plant, Jadotville, Belgian Congo.

WHITE COBALT ALLOY is cast for export and refining at the Panda electric furnace plant, Jadotville.

On African Smelting Progress

Two main types of deposits are worked: a relatively soft, altered pegmatite and a hard, primary pegmatite. Both are open-cut. Tantalite-columbite occurs to an extent of about 5% of the cassiterite and is recovered with it. Spodumene is also widely distributed in the orebody and weathers rapidly, when exposed, to a kaolin-like product carrying about 1% lithium oxide. A pilot plant for its extraction is under consideration. There are ample supplies of raw material available in the form of old tailings dumps.

Altered pegmatite is extracted by electric shovels and washed for cassiterite which is then sized into three fractions for magnetic separation of about three-quarters of its tantalite-columbite. Cassiterite is then smelted, remaining tantalite-columbite being recovered in the slag. Smelting follows a conventional flow-sheet but electric furnaces are used instead of the usual coal-fired reverberatories. The furnaces have open tops and are hand-fed nearly to floor level. This reduces fume to a minimum and has eliminated need for a cyclone and baghouse. Liquation, drossing and slag retreatment are also fully electrified.

Smelter capacity is about 10,000 tons of metallic tin. A peak of 9,600 tons was achieved in 1942, while 1952 output was only about 2,500 tons; 1953 production was also restricted because of falling prices. See Table 1 for furnace data.

Table 1. Furnace Data. Géomines Tin Smelter

	Current KW	Temp deg C
Initial smelting furnace	3-phase 1000	1200
Slag retreatment furnace	3-phase 850	1400
Liquidation hearths	54	300
Refining kettle	100	400

Table 2. Analyses of Géomines Ore and Products

"Hard Rock" (Primary deposit)	2–2.5 kg cassiterite per cu m
Altered pegmatite (Secondary)	1–1.5 kg cassiterite per cu m
Conc. from primary deposit	Sn 70–71% As 1–2% X_2O_5* 2–3%
Conc. from secondary deposit	Sn 72% X_2O_5 3–4%
Tantalite-columbite conc.	Sn 2% Ta_2O_5 35–40% Cb_2O_5 30–35%
Slag	Sn 2% X_2O_5 20–25%
Refined tin	Sn 99.975%

*X_2O_5 indicates combined oxides of Ta and Cb.

Hard pegmatite is blasted, handled with 6½-cu yd electric shovels crushed and transported to the so-called "hard-rock plant" (commenced operations in 1950). There it is crushed and ground to minus 3mm before jigging and tabling to concentrate the mineral. Current mining difficulties do not permit the concentrator working at full capacity; nevertheless, a fourfold increase in capacity has been planned. Concentrate from the hard-rock plant is not smelted locally due to contained arsenic (from arsenopyrite and loallingite in the ore.) Experiments indicate that a pre-smelting roast, followed by magnetic separation, will fit in the local reduction. See Table 2 for analyses of Géomines ores, concentrates, and products.

Union Miniére du Haut-Katanga. From Manono, it is 300 mi by road to Elizabethville, administrative center of the great Union Miniére. The company exploits a vast concession which, in Australia, would probably be operated by a dozen companies. Outstanding features of Union Miniére's undertakings seen by the writer are: (a) Far-sighted development of hydroelectric power resources (known deposits of coal are inadequate). (b) Size and richness of oxidized copper and copper-cobalt orebodies. (c) Flotation of oxidized ores. (d) Electrowinning of

LABOR IS SCARCE IN PARTS OF AFRICA, but more plentiful than in Australia. Note well-protected converter puncher (left).

WORKMEN CAST high-purity blister copper at Roan Antelope copper smelter.

Table 3. Ores and Concentrates, Union Miniére's Western Mines

Ruwe mine copper ore	Cu 4–5% Washed Conc. 30–32% Cu
Musonoi copper-cobalt ore	Cu 6–7% Co 0.35% Flot. Conc. Cu 28%, Co 0.8%
Musonoi cobalt-copper ore	Cu 2% Co 2% Flot. Conc. Cu 12%, Co 8–9%
Musonoi cobalt-rich ore	Cu 0.5% Co 6–7% Selective mining, no conc.

copper and cobalt. (e) Electric smelting of cobalt-bearing and other materials. (f) Sintering and smelting of zincy copper concentrate in the blast furnace. (g) Organization and attention to welfare of native labor.

Union Miniére's "Western Mines". The principal source of oxidized ores today is the Kolwezi-Ruwe area, 240 mi west of Elizabethville, where such mines as Kolwezi, Musonoi, Kamoto and Ruwe are known, collectively, as the "Western Mines". All are open cuts containing malachite as the principal economic mineral. Cobalt (as black oxides: heterogenite, lampadite) is present in some of the deposits.

Washeries are established at Kamoto and Ruwe and a flotation concentrator at Kolwezi. Depending upon their nature, ores receive either a simple washing treatment or flotation or both. Small amounts of rich ore are mined selectively. Characteristic ores and products are given in Table 3.

Certain other mines contain rich cobalt or cobalt-copper ores but their importance is diminishing while that of the Western Mines is increasing.

Capacity of the Kolwezi concentrator is 130,000 tons of ore monthly. New construction under way will increase this to 240.000 tons. The ores listed in Table 3 as "copper-cobalt" and "cobalt-copper" are floated at Kolwezi in separate campaigns. A month's operations with these yields, respectively, 30,000 tons and 24,000 tons of concentrates. Reagents used are of special interest and listed in Table 4.

Table 4. Reagents used at Kolwezi Concentrator

	g per metric ton
Sodium silicate (for dispersion of gangue)	600
Sodium carbonate (To soften water to pH 9)	7–800
Hydrolyzed palm oil (collector)	1300

Jadotville Leaching and Electrowinning Plants. About 28-30,000 tons of flotation and washed concentrates from the Western Mines, with cobalt built up to 1% in the combined feed, are leached each month at Jadotville, 110 mi from Kolwezi towards Elizabethville. The lixiviant is spent electrolyte from following electrowinning operations. Make-up sulphuric acid is obtained from a nearby manufacturing plant, source of sulphur being zinc concentrate from the Prince Leopold sulphide copper-zinc mine 19 mi from Elizabethville.

Due to the very fine particle size of much oxidized concentrate, leaching is in pachuca tanks, while special care is necessary in clarifying liquor before electrolysis. Cells are unusually long to save capital cost but the most unusual feature is the presence of considerable cobalt in the electrolyte. Bleeding of the solution controls its concentration and affords a starting point for cobalt recovery. Hard lead anodes are employed in the cells and the electrolyte surface is kept covered with a film of gas oil to prevent acid mist fouling the tankhouse atmosphere. Table 5 gives cellroom data of the copper electrolytic section

Table 5. Cellroom Data, Jadotville Electrolytic Copper Section

160 tanks, 62 ft x 3¼ ft wide x 4 ft deep.
191 anodes of 6% antimonial lead; 188 cathodes.
Electrolyte (grams per liter): Cu 60; H_2S_4 20; Co 23
Spent electrolyte (grams per liter): Cu 26; Co 25
Current density: 18 amp per sq ft; Voltage 2.12 v.
Current efficiency 90%; total kwh per ton Cu 2360
Cathodes 99.6% Cu, balance mainly occluded pulp

Annual capacity is 100,000 tons of copper, more than half of which originates from the Ruwe mine. Cathode starting sheets are prepared from copper anodes, metal for which is obtained by black copper smelting of suitable oxidized ores at the Lubumbashi smelter, Elizabethville. Finished copper is conventionally melted, blown and poled before casting on Clark wheels. The refining slag contains some cobalt and is smelted with other materials in the cobalt electric furnaces.

Cobalt Recovery by Electrolysis. The starting point for cobalt recovery from the copper electrowinning plant is the washed, leached gangue, the

solution with the gangue assaying 6-7 g Co per liter. The treatment has already been described in *E&MJ*[2] so will not be repeated here. Table 6 contains fundamental data on this plant.

Cathodes are removed from the cells daily for scraping. After four days, the cobalt deposit is beaten off with hammers. Purity is then 93-94%.

Table 6. Data on Jadotville Electrolytic Cobalt Plant

12 anodes of 6% antimonial lead; 13 steel cathodes
Electrolyte (grams per liter) Co 10; Mn 5; MgO 40; CaO saturated, solids 100; $(NH_4)_2SO_4$, 5; pH 6
Current density: 55 amp per sq ft; voltage 3.19 v; Current efficiency 85%
kwh per lb of cobalt, 3

It is melted and refined to 99.1% in an electric furnace before granulating in water. Plant capacity is about 4,000 tons yearly.

Electric Smelting for Cobalt. The cobalt electric furnace smelting plant is quite separate from the electrowinning division described above. Its principal feed comprises cobalt-copper concentrates from the Kolwezi concentrator plus other materials of suitable cobalt content.

Before smelting, carbonates are sintered on small Dwight-Lloyd machines to liberate carbon dioxide; otherwise smelting is too "lively". The resulting product, which is of good physical quality, is hand fed to the furnaces with refinery slags and lump lime (flux) and coke as a reducer. Products are "white alloy" (shipped to Belgium for refining), red alloy (refined to copper and a cobaltiferous slag at the Lubumbashi smelter) and waste slag, normally discarded, but currently used in making low-grade cement to alleviate shortage of this material.

Annual output of cobalt in white alloy averages up to 3,000 tons. In all nearly 75% of the world's cobalt has been produced each year in the Jadotville area. See Tables 7 and 8 for data on the cobalt smelting operations.

Table 7. Cobalt Electric Furnace Data, Jadotville

No. Furnaces Available	Type	KVA	Volts	Temp. Deg. C
6	Single-phase	720	140	1450
1	Three-phase	2160	245	1450
1	Three-phase	3000		

Table 8. Furnace Charges and Products, Jadotville (Composition in percent)

	Co	Fe	Cu	SiO_2	Al_2O_3	CaO	MgO
Charge	8-9	7-8	8-10				
Slag	0.3	2-3	0.5	41	7-8	36	6-8
Red Alloy	5	5	85-90				
White Alloy	47-49	35	15	2	(silicon)		

Other Electric Smelting. The electric furnaces have also been used to produce such diverse materials as pig iron, ferro-alloys, sodium silicate and lead. Of special interest are current experiments in copper matte smelting. Based upon results already obtained, an electric furnace plant and converter are to be installed at Kolwezi for the treatment of high grade sulphide concentrates. Initial production will be at the rate of 20,000 tons of copper annually from this venture.

Prince Leopold Mine, Kipushi.[3] This mine, nineteen mi from Elizabethville supplies a zincy copper concentrate which constitutes the principal raw material for the Lubumbashi smelter, at Elizabethville itself. Zinc concentrates are also produced and are the source of sulphuric acid, manufactured at Jadotville for the leaching plant there. Calcines are exported but an electrolytic zinc refinery under construction near Kolwezi will ultimately extract the zinc on the spot. This refinery has an assured supply of raw material, for the Prince Leopold Mine is increasing in zinc at the expense of copper at depth. In addition, the great slag dump at the Lubumbashi smelter contains a large reserve of extractable zinc.

The Lubumbashi Smelter. This plant had the greatest interest to the writer, due to many technical problems similar to those at home. Formerly a large producer of black copper, the crude metal is now produced for only a few weeks in each year due to the depletion of suitable ores; as already mentioned, it is used to make starting sheets at Jadotville.

To avoid cost of installing reverberatory furnaces, existing blast furnaces were retained for matte-smelting. Charge materials are sintered on large Dwight-Lloyd machines, excellent sinter being made. Furnace speed is very good and matte grade one of the world's highest. Slag is unusually rich in zinc: the huge, pyramidal dump, some 300 ft high, contains 6-million tons of granulated slag carrying 700,000 tons of metallic zinc! Matte, tapped from a holding furnace, is converted in a Peirce-Smith converter. Up to 27,000 tons (500-600 blows) are obtained before re-lining the tuyere zone—an excellent performance achieved by close temperature control and perfection of a system of hot-patching with a mixture of crushed magnesite and pitch. Blister copper is transferred to a rotary furnace and cast into slabs on a straight-line machine.

Portion of the daily blister production is oxidized in the rotary furnace by inserting pipes carrying compressed air. Soda ash is then injected by compressed air gun and a sodium arsenate slag skimmed from the surface. In this way, arsenic is reduced from about 0.25% to less than 0.05%. Approximately one-third of output is soda-treated in this manner. Annual output of blister from this plant is 70-80,000 tons.

Dwight-Lloyd gases pass through cyclones to the main stack. Blast furnace dust is collected in cyclones, true fume then passing to an intensive type baghouse for filtration. Fume will later be treated

Table 9. Data—Lubumbashi Smelter

Three Dwight-Lloyd machines each 5 ft x 66 ft
Four water jacketted blast furnaces, each 5 ft x 20 ft at tuyeres; internal crucibles (one furnace only used at a time) Coke consumption 9-10%. Daily burden smelted 1300 tons (no operations on Sundays)
One matte-holding furnace, pulverised coal fired, 120 tons capacity
One Peirce-Smith converter 13 ft x 30 ft lined with Vereeniging (South African) burned magnesite bricks. Operating temp 1225 C; coal burner on vessel; 50 2-in. tuyeres at 6-in. centers.
Baghouse with 44 cells, filters 65 cu m at 100 deg. C.
Circular brick stack 492 ft high.
One rotary casting furnace, 10 ft x 30 ft, magnesite brick lined.

Table 10. Product Analysis, Lubumbashi Smelter

	Cu	Fe	Zn	Pb	S	SiO_2	As	Cd	Ge
Sinter	30	12	12	1.5	12	15			
Matte	64-65	5	5-6	2-3	21				
Blast furnace slag	1.1	22	16	0.5		31			
Cyclone dust	25	10	12	1	14	11			
Baghouse fume			37	23	9		7	4	0.25
Converter slag	14	22	16	6	2	20			
Blister-copper	98.9	0.015	.022	.2			0.206		
De-arsenified blister	99.1	0.014	.025	.1			0.033		

[2] *E&MJ*, December 1951, p 96.
[3] *E&MJ*, November 1951, p 89.

for recovery of cadmium, zinc and lead. Converter gases traverse balloon flues before joining baghouse effluent and sinter plant gases in the stack.

See Tables 9 and 10 for data on the Lubumbashi smelter and an analysis of smelter products.

Power. Union Miniére's power requirements are supplied by a subsidiary. There are two existing hydro stations with a total potential of 122,000 hp, while a third plant of 160,000 hp capacity is scheduled for completion on the Lualaba (Upper Congo) River, not far from Kolwezi. This will supply the power necessary for the electrolytic zinc plant and electric copper smelter already referred to, as well as being available for expanding operations generally. Reserve steam plants at Jadotville and Elizabethville may provide a further 57,000 hp if it should be required.

Rhodesia. [Editor's Note: The author made an interesting study of all important Rhodesian operations. However, comment here is limited to Roan Antelope and Mufulira projects because others have been covered quite fully in *E&MJ*, July and August 1953.]

The size and richness of Rhodesian copper deposits are very impressive to a visitor. Proven reserves are reported to total some 600-million tons of 3.7% copper ore. Other observations which can be made generally about the Rhodesian district are: (a) Great potentialities for sulphur recovery. (b) Overwhelming hospitality—surely among the warmest in the world.

Roan Antelope Copper Mines Ltd. Concentration and smelting practice has been well described in recent years[4] but a few observations are relevant here. The concentrator is handling record tonnages, exceeding 350,000 tons monthly. Changes in the nature of ore over a period of years have reduced concentrate grade, though still high by most standards. Steam heating of pulp prior to filtration reduces moisture content by up to 2%, with improved reverberatory furnace results.

Smelting is conventional but converting unusual, in that high temperatures are aimed at to promote bismuth elimination. To ensure high temperatures, silica additions are kept to a minimum and some reverberatory slag is added to the converter as partial flux some time after the blow commences. All matte skulls are broken up and returned to the reverberatories, while doping of cold scrap is permissible only near the end of the blowing cycle. It has been found that premature formation of copper by early doping collects bismuth from the matte and, once absorbed by the copper, it is not removed by further blowing. The converters are comparatively small (due to extremely high grade mattes originally treated). Lining life suffers as a result of the high temperatures (rising to 1325 deg C), averaging 150 blows.

Monthly blister output is around 7-8,000 tons. It is shipped to England for fire refining.

Mufulira Copper Mines Ltd. Practice at Mufulira is essentially similar to that at Roan Antelope but with even more emphasis upon the need for high converter temperatures for bismuth elimination. Pulverized coal is burned in the converters between blows and during the first thirty minutes of blowing as well (Mufulira is now the only Rhodesian smelter burning coal in its converters).

To prevent matte grade rising above approximately 62.5% Cu, which would adversely affect bismuth elimination, pyrites and duff coal are incorporated in reverberatory furnace charges. The smelting of N'Changa concentrate necessitates more pyrite than Mufulira concentrate alone. (At Roan Antelope, pyrite is used when the charge contains N'Changa material but not when only Roan concentrates are smelted).

Smelting practice, with full discussion on bismuth elimination, is available in recent literature[5].

Blister, ladled into a rotary furnace, has been cast for export. Recently, a rotary anode furnace and electrolytic refinery were completed. Monthly output has been about 7,000 tons.

See Tables 11 to 16, inclusive, for metallurgical data on Roan Antelope and Mufulira operations.

Metallurgical Data—Roan Antelope and Mufulira

Table 11. Smelting Units

Roan Antelope One 25x120-ft reverb.; One 28x120-ft reverb.; One 28x95.5-ft reverb; Four 12x20-ft Peirce-Smith converters.
Mufulira. Two 28x100.5-ft reverbs; Three 13x30-ft Peirce-Smith converters.

Table 12. Analyses of Concentrates (Percent)

	Cu	Co	Fe	S	SiO_2	Al_2O_3	CaO
Roan Antelope	43		13	22	14	3	1
Mufulira	50		8	19	14	2	

Note: Owing to the relatively high silica content of concentrates, considerable limestone is required in fluxing at the smelters.

Table 13. Typical Copper Mattes (Percent)

	Cu	Fe	S
Roan Antelope	62.5	12.7	22
Mufulira	62.5	13.2	23

Table 14. Typical Reverberatory Slags (Percent)

	Cu	Co	FeO	S	SiO_2	Al_2O_3	CaO
Roan Antelope	0.96		27.5	0.2	35.6	8.9	20.3
Mufulira	0.42		25.5	0.1	42.4	7.3	20.0

Note: The writer has had considerable experience with varying matte grades, varying slag components and different methods of slag analysis for copper. This has made him extremely diffident about comparing the slag losses of different smelters unless all conditions are known and carefully standardized.

Table 15. Typical Converter Slags (Percent)

	Cu	Co	FeO	SiO_2	Al_2O_3	CaO
Roan Antelope	6.2		42.5	25.4	7.0	11.1
Mufulira	9.8		52	22	3	7

Note: Roan and Mufulira slags reflect the practice of adding reverberatory slag to the converters.

Table 16. Blister Copper Analyses

	Cu	Fe	S	Ni	Co	Bi	Se	Te	As	Sb	Pb
Roan Antelope	99.44	.005	.034	.007	.0004	.0009	.014	.0002	.0002	.0003	.0008
Mufulira	99.55	.006	.072	.003	Tr	.0017	.004	.0002	.0023	.0003	.0012

Acknowledgements

I wish to thank officers and staff members of the following companies for all courtesies extended to me during my visit to African properties: Géomines; Union Miniére du Haut-Katanga; Roan Antelope Copper Mines, Ltd.; Rhokana Corporation; Rhodesia Copper Refineries, Ltd.; N'Changa Consolidated; Mufilira Copper Mines, Ltd.; and Rhodesia Broken Hill; also other properties not discussed here.

[4] AIME, 1948.

[5] AIME, 1948.

WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

President's Panel Hears Mining Spokesman Urge Coordinated Federal Minerals Program

THE PRESIDENT'S Inter-Agency Mineral Policy Committee, which was created in October, is studying proposals to clarify and define responsibilities of the various government agencies for metals and minerals. This would have to be accomplished before the committee could ever hope to recommend specific legislation or executive action outlining a national mineral policy.

A major proposal has been made by an influential mining engineer close to government and industry, which would coordinate the government's mineral programs. It offers three alternatives: Creation of a single agency of cabinet rank to deal with metals and minerals; delegation of new authority to the Office of Defense Mobilization in the mineral field; or establishment of a special mineral coordinator in the executive office of the President.

The last alternative is the most novel, and would undoubtedly have the best chance to succeed. The mineral coordinator's authority would be clearly defined by law or executive order, according to the proposal now before the President's committee. His job would be to recommend policy in the mineral field, and to see that such policy is implemented by the various government agencies concerned with metals and minerals.

As has been reiterated so many times, the main reason for the government's chaotic relations with the mining industry is that responsibility for decisions affecting metals and minerals is scattered among many uncoordinated agencies. Creation of one office, responsible only to the White House, to coordinate these decisions and to initiate mineral policy, would go a long way toward alleviating the situation.

The author of the proposal has colorfully described what now goes on behind the scenes: "Instead of dealing with producers able to expand supplies of materials or dealing with consumers capable of conserving and redirecting the uses of scarce materials, much of the time of major government officials concerned with metals is spent in interagency committees or negotiating with officials of other U. S. Government agencies."

Factors in Mineral Policy

In tackling the problem of mineral policy, the President's committee must still determine what areas the policy should cover. The matter of clarifying and defining responsibilities is certainly the initial one.

The official who proposed the establishment of a mineral coordinator's office has outlined some other elements that should be contained in a meaningful national mineral policy. Following are excerpts:

● **Stockpiling.** There is still controversy on the size of stockpile objectives, which stem mainly from inadequate data on military and essential civilian requirements. Stockpile objectives were scheduled for completion in five years; but seven years after the program's start, only $4.2-billion worth of materials are on hand out of $7.2-billion worth of total objectives.

● **Mobilization Planning.** The mining industry must be allowed effective participation in the development of plans for price controls, allocations, and other emergency regulations affecting metals and minerals.

● **Technical Assistance.** Private industry is spending millions in the search for new mineral deposits, but the efforts of the government in basic geological and geophysical research have not kept pace with current needs. Basic metallurgical research on extraction of materials from low-grade ores and on finding new uses for more abundant materials must be accelerated. Industry does outstanding work in applied research; the government should sponsor or conduct far more basic research in metals and minerals.

● **Federal Taxes.** Since tax laws are subject to annual amendment, often on the basis of hurried consideration, they do not provide an adequate and dependable incentive for investment of American venture capital in exploration and development of metal and mineral deposits in the U. S. or in foreign countries.

● **State Taxes.** Annual state taxes based on the value of an orebody in place inhibit many mine operators from further extending geophysical and geological exploration and development. Where state taxes are essential, a severance tax—on the mineral actually mined in a specific period—would be less restrictive.

● **Risk Capital.** Restrictions on the sale of securities are intended to protect gullible investors from fraud, but present regulations tend to inhibit the flow of venture capital into new mining properties. Revisions of state and federal regulations should be made.

● **Public Lands.** The government has extended its control of public lands by a series of withdrawals, patent procedures, and other restrictive measures affecting the public domain. Loose and confusing record systems encourage fraud and hinder mining development. The government should administer public lands so that development of mineral industries is fostered.

● **Conservation.** Research on methods of recovering minerals as by-products or from low-grade deposits and advances in metallurgy and ceramics must be encouraged. Mining practices that leave substantial quantities of ore in abandoned workings are anti-conservation from the national viewpoint.

● **Market guarantees.** Under the Defense Production Act, commitments to purchase over $6-billion worth of metals and minerals have been made by the government to expand supplies of materials, particularly from new sources. Some of the contracts run to 1962. The contracts must be administered so that there is no unfavorable impact on normal mineral output from unassisted sources. Major attention must be given the disposition of material under government contingent contracts in the event of any slight economic recession in the future.

Policy Committee Progress

Several important officials participating in the mineral policy committee's staff work are frankly pessimistic about what the committee will accomplish. Says one: "The committee has bitten off more than it can chew." Prospect is that the committee's report will be a mild series of resolutions destined to please few and harm none.

Biggest headache of the committee will be to correlate the domestic mineral policy with the administration's foreign economic policy. The industry can expect little if any protectionist sentiment in the committee's final report. (The proposal for a national mineral policy outlined above, for example, effectively skirts the tariff issue.)

In his speech to the American Mining Congress in New York City last month, Interior Secretary McKay gave a hint of what's to come, with these remarks:

"In the matter of imports, we cannot deal with the problem without carefully considering it alongside other national and international objectives. International trade in min-

(Continued on page 102)

LABOR THIS MONTH

Alan E. Adams, McGraw-Hill Washington News Bureau

TAFT-HARTLEY BATTLE: Administration efforts to liberalize law are running into stout opposition by industry forces hoping to tighten reins on unions. But both sides may come to terms on one amendment setting up effective measures against Communist-dominated unions.

Goldwater and Butler bills are being dusted off for a new look. The first would allow the Subversive Activities Board to ferret out such unions; the second would deny bargaining rights to Communist-controlled unions.

RECENT EVENTS CAUSING NEW DRIVE: Decisions by Federal Appeals Courts are blocking NLRB attempts to crack-down on Communist unions. Under new Chairman Guy Farmer, the Board issued orders that unions would not be certified if their officials were under indictment for filing false non-Communist oaths; it sought to have union officials reaffirm oaths at Board request.

The courts, on appeal from affected left-wing union leaders, struck down the Board's efforts. NLRB is expected to carry fight to the Supreme Court but meanwhile it is powerless to prevent suspected unions from using the facilities of the Board.

GENERAL ELECTRIC ORDER ON COMMUNIST EMPLOYEES: GE's ruling that admitted Communists or saboteurs will be fired, and workers using Fifth Amendment to avoid testifying will be suspended, pointed up difficulty of getting rid of Red union leaders. G.E. policy can not touch union officials not working for company.

CONCRETE ACTION UP TO ADMINISTRATION AND CONGRESS: Justice and Defense Departments are seeking ways to control Red unions. Last month the Defense Department's Chief Security Officer, Robert L. Applegate, urged the Government be permitted to ban security risks from any jobs that would be indispensable in case of war.

ANTI-REDS SPLIT WITH MINE-MILL: Three Mine-Mill Locals, at Butte and Anaconda, Mont., have moved to join the CIO Steel Workers in the first defection among the mining union locals. Breakaway of the three locals' 7,000 members was led by Walter Mason, president of District 1, who was recently elected to the union's executive board and has opposed IUMMW secretary-treasurer Maurice Travis and associates. CIO president Walter Reuther hailed the move and called Mine-Mill a "disintegrating" labor organization.

MINE-MILL HITS AT UNEMPLOYMENT: Union's area conferences last month okayed leaders programs to offset unemployment. These included: (1) Drive for immediate higher wages, Federal jobless payments added to unemployment benefits, increased tax exemption for incomes under $5,000 a year, (2) A pledge to fight for relief of small and marginal mine operators, large scale public works program to consume large amounts of lead, zinc and copper, and for greater foreign consumption of goods containing metals.

UNION FEARS MORE JOB TROUBLE: Secretary-treasurer Travis expects Chile to release copper supply, causing new unemployment in this branch of industry. Such a move would hit Mine-Mill where it hurts—in its organizational program.

SUPREME COURT RULINGS VITAL TO LABOR-MANAGEMENT RELATIONS: High court last month held that (1) disloyalty to employer is grounds for dismissal. During strike, TV station employees circulated handbills sharply critical of company policies. Court said action was aimed at hurting company's reputation and reducing income—a basic cause for discharge; (2) State labor laws cannot be used for redress against union activities if alleged violations come under Taft-Hartley.

erals and metals is an important part of our entire foreign policy.

"It is a vital segment of the nation's entire industrial economy. Because of its interrelationship with everything we do and the interdependence of the world in which we live, any simple or clear answer is not easily forthcoming. Without laboring the point, it is evident that international trade can never be regarded as a one-way street."

ODM Ups Titanium Goals

ODM HAS INCREASED the titanium expansion goal from 25,000 tons annually in 1956 to 35,000 tons. The hike was made under pressure from Senator Malone, the military services, and aircraft manufacturers.

GSA plans to contract for the entire 35,000 tons by March 31. At press time, annual output of only 13,200 tons of titanium had been lined up for 1956—3,600 from DuPont, 3,600 from Titanium Metals Corp., and 6,000 tons from Crane Co.

The 35,000-ton goal had been originally recommended by the Pentagon two years ago. ODM then reduced the goal to 10,000 tons, then boosted it to 22,000 tons and later to 25,000 tons. Changes in goals have really had little but academic significance.

Wary of Cost

Main reason for changes in goals: civilian agencies have been inclined to pooh-pooh military requirements for titanium because of the metal's high cost. Their feeling has been that military appropriations are inadequate to support purchases of as much titanium product as the military says it needs. With market guarantees for as much as 35,000 tons of titanium, the Treasury may be left holding the bag, they feel.

In general, the government has subsidized titanium production through cash advances against future production, fast tax writeoffs on new plants, and a market guarantee arrangement. With such liberal conditions, ODM and GSA have been naturally reluctant to go fast.

To meet the new goal, the government will probably advance over $100-million for new titanium plant and equipment and will have to modify its original program. ODM had hoped to get about 10 different producers into sponge production using at least three different processes. It will have to promote the 35,000-ton output now with only about five companies—all using modifications of the Kroll therma-reduction process, which experts say will soon be obsolete.

Leading candidates for new government titanium contracts at press time were Monsanto, Titanium Metals Corp., and DuPont. Union Carbide's Electro Metallurgical Co. is reportedly willing to invest its own money in a 10,000 plant. Kennecott may be later on.

DORRCO DOINGS IN 1953

The story of the blind men and the elephant is recalled by today's outlook. One sees only the military strength behind the Iron Curtain, greatly enhanced by the free world's blindness, and feels we should expect hell to come the next minute.

Another, thinking back a few years, sees now great advances in so many areas—no actual fighting in Korea, great physical and moral strength in our European allies, and evidences of internal breakdown in East Germany and other areas behind the Iron Curtain.

We feel that education must be permeating slowly and that in time a reaction will take place. To those of us who are impatient I would recommend Henry Field's fascinating "The Track of Man" to learn how many of our problems reach back 5000 years.

* * *

NEW DEVELOPMENTS— Collaborating with our Associates in Holland, we have developed the application of the TM Dorr-Clone to the starch industry on a commercial scale. This new unit is also proving broadly successful in filtrate clarification and fine sizing of materials in the 2 to 20 micron range.

The Aldrich System, consisting of an annular sand filter combined with a mechanical pre-treatment unit, provides complete water purification in a single machine. A new method of sludge thickening has been developed for sewage treatment which substantially reduces digestion capacity requirements.

As a result of continuing efforts to increase the efficiency of the Dorr Continuous Recausticizing System, the Dorrco White Liquor Polishing Station was added to our line in 1953. It further clarifies the effluent of the White Liquor Clarifier by removing colloidal material which cannot be handled by gravity separation.

WATER TREATMENT— Two 200 ft. pre-sedimentation Thickeners were installed at Kansas City, Missouri, to remove turbidity from Missouri River water prior to conventional purification steps, and Dorrco Flocculators and Monorakes helped provide Dayton, Ohio with an economical new 96 MGD treatment plant. The trend first mentioned in 1952 of the mechanization of plants serving small communities continued again last year.

SEWAGE AND INDUSTRIAL WASTE— Pennsylvania's Clean Streams Program brought for Easton and Bethlehem two outstanding new sewage treatment plants employing Biofiltration and Multdigestion. The world's largest Biofiltration plant, now under construction at Beaumont, Texas, will incorporate four 195 ft. dia. Dorrco Distributors. A large Dorrco d-i System was ordered to clean up a copper, nickel and chrome plating waste for one of America's largest automobile producers.

METALLURGICAL— At the Robena Mine of U. S. Steel Corporation's Coal Division, a 6″ dia. DorrClone, equipped with the new Type CB abrasion resistant liner, showed only negligible wear after over 2300 operating hours on the line. On the Mesabi Range, the Dorr 4-Arm Torq Thickener found extensive application handling taconite mill tailings during the year, and noteworthy metallurgical orders included 16 HX Classifiers and 20 DorrClones for closed circuit grinding of copper ore and acid proof rake Classifiers for washing sandy pulp in a uranium extraction plant.

FERTILIZER PLANT DESIGN— Evidence of continued interest in the fertilizer field is the design of a phosphoric acid plant for Norway and an ammonium phosphate plant for Japan. Engineering initiated in 1952 was completed on a triple superphosphate plant in Florida for The Davison Chemical Corp., and work continued on a large concentrated mixed granulated fertilizer plant for Missouri Farmers Association. Both of these plants will go into operation in 1954.

ABROAD— Once again our Associates overseas have had a very prosperous year. A marked increase has been noted in the number of South American and Near Eastern projects handled by our European companies, and, to facilitate delivery, we have instituted local manufacture of our equipment in Brazil. Among the many installations put into operation or under construction this year were a sewage treatment plant in India, a cyanide plant in Yugoslavia, two FluoSolids Systems to roast pyrite in South Africa, and a project involving the FluoSolids treatment and leaching of a copper-zinc concentrate in Japan.

FLUOSOLIDS— Two FluoSolids Systems went into operation in the United States alone in 1953 producing SO_2 gas for the manufacture of a daily total of 600 tons of sulfuric acid by the contact process. FluoSolids Systems were in operation or under construction by the end of the year for sulfite paper mills with a total capacity of three-quarters of a million tons of pulp per year; the roasting of zinc concentrates and subsequent electrowinning or retort smelting of about 100,000 tons of metal annually; the roasting of gold ores for the cyanide recovery of almost 25 million dollars worth of gold per year; and sulfuric acid plants with an annual capacity of about one million tons of acid. Our work on fundamentals has continued, and many new applications of FluoSolids and FluoDry show great promise.

* * *

'53 has been a year of change for us, worse in anticipation than realization. It has brought our New York home and office within two blocks of each other, and of the Chemists' Club, as well as also close to Grand Central trains to Connecticut. Our Westport home has seen grand and great-grandchildren visiting, a great Spring flood and a drought in late Summer with a reparation-conscious bulldozer used to catch a 12″ trout. The latter may have inspired a fishing trip airborne a hundred and fifty miles north of the Saguenay.

The year has been generally one of closing ranks, better production facilities in Denver and Orillia, and continued improvement in internal operations. Major executive changes, consistent with our retirement plan, have gone through smoothly.

Many visitors from our European staff have been welcomed, and one executive from Amsterdam is here taking the Advanced Management Course at Harvard.

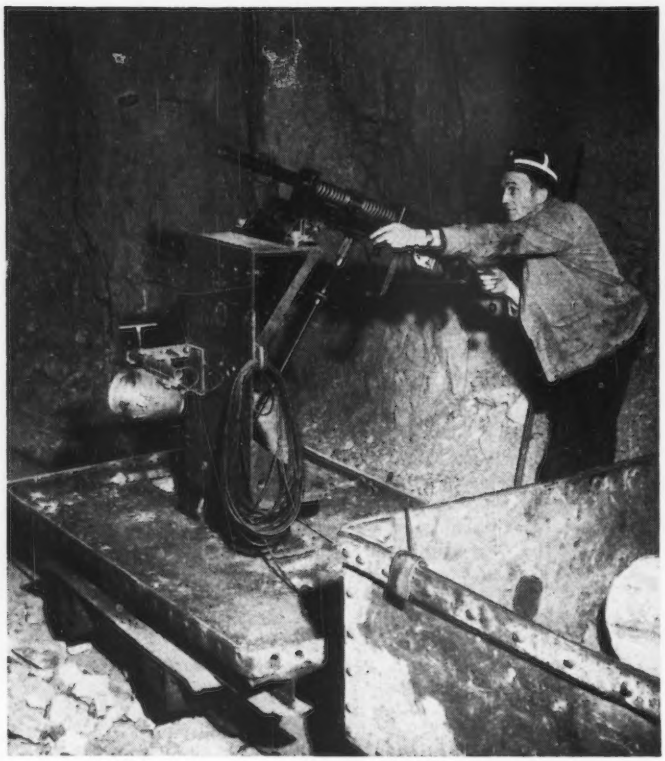
We are preparing for our 50th Anniversary of the invention of the Dorr Classifier in July 1954.

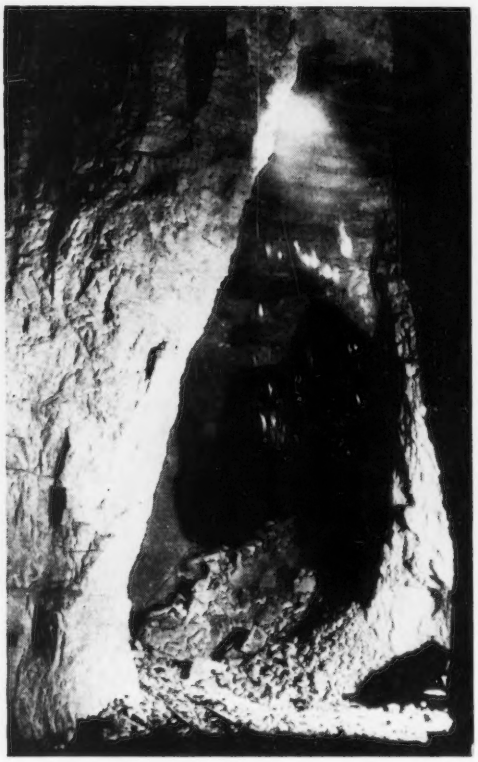
Wherever they are scattered, Dorrco staff, I know, join in good wishes to all friends worldwide.

Barry Place, Stamford, Conn.

DORRCO

OPERATING IDEAS





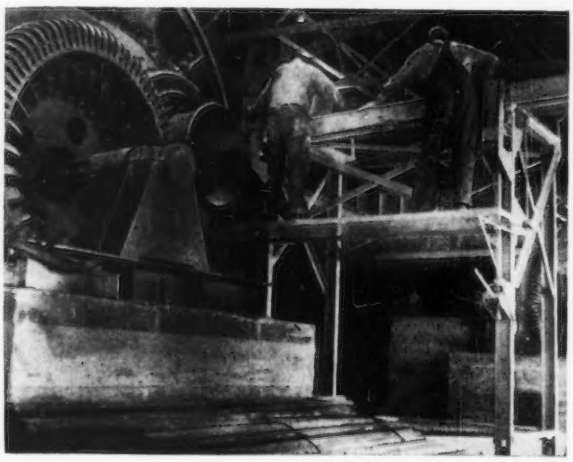
Industrial Gun Trims Mine Roof

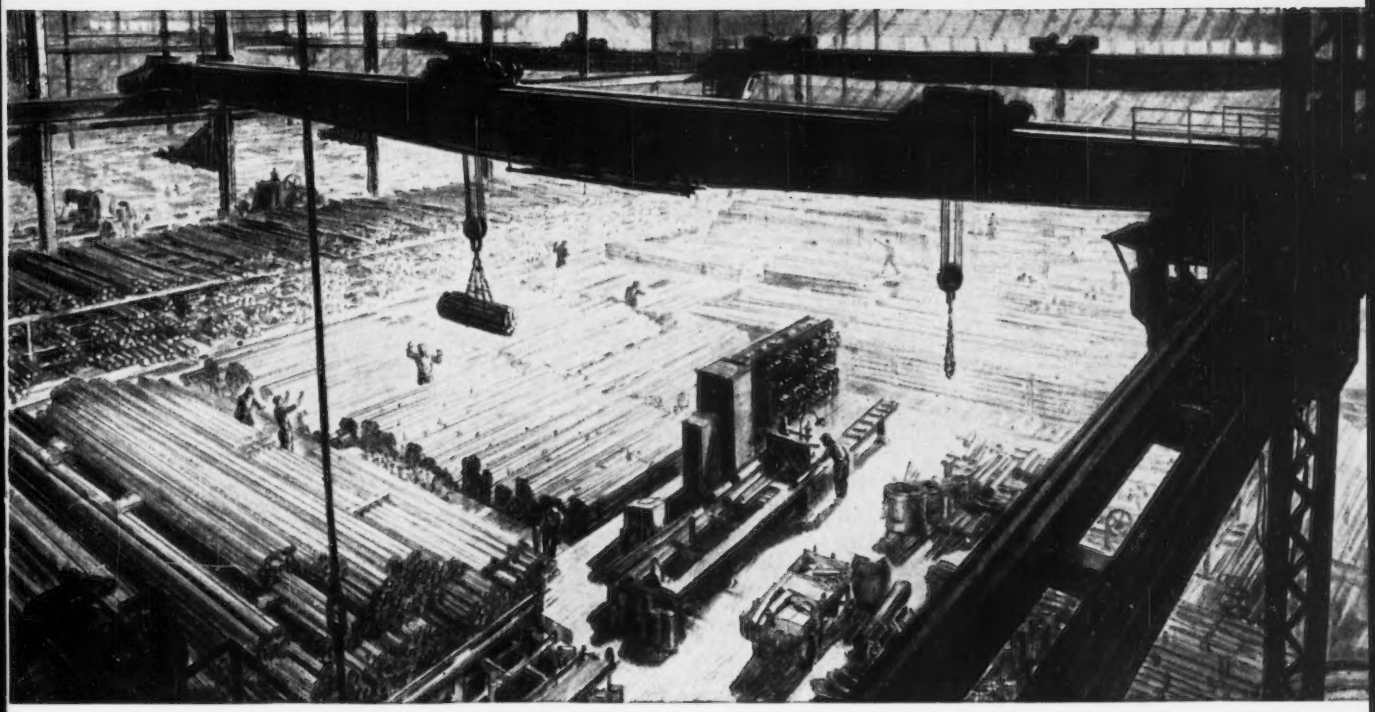
CHUTE BLASTERS and other mine operators have always dreamed of the day when they would be able to bring down a hang-up or scale the back with some kind of a bazooka, mortar, or gun. Partial achievement of that objective is illustrated here in the form of a Remington Industrial gun which is used at the St. Joseph Lead Co. operations, Bonne Terre, Mo., to bring down an occasional bit of loose from a high back. The 8-gage gun fires a 3-oz. slug of lead. Powder charge is 5½ drams. The blur in the center of the right photograph shows some loose rock on its way to the mine floor, after having been shot out of the back with the industrial gun shown at left. St. Joseph Lead Co. staff members adopted this technique after seeing it in use in mining operations of Tennessee Coal and Iron Division of U.S. Steel Co, in eastern Tennessee. Photos, courtesy Safety Department, St. Joseph Lead Co., Bonne Terre, Mo.

Rod Charging Machine at St. Joe's Federal Mill

THE NORMALLY STRENUOUS JOB of charging rods into a rod mill was considerably simplified at the Federal mill of the St. Joseph Lead Co. with the unit shown here. The design is a modified version of the charging machine used by International Nickel Co. in Canada.

An overhead crane picks up the portable steel structure, and positions it in front of the discharge end of the rod mill. Then a bundle of 3-in. rods is raised by crane to the top platform of the charging machine. Next a lever is tripped which allows one rod at a time to roll onto slightly inclined rollers. A slight push by the mill operator sends the rod smoothly on its way into the mill. Photo, courtesy Safety Department, St. Joseph Lead Co., Bonne Terre, Mo.





steel stocks...
...again complete!

For years, as you well know, the demand for steel has exceeded the supply. So while we have been able to furnish many thousands of tons from our stocks, all kinds and sizes have not always been available.

Now we are glad to report that our stocks of Ryerson Certified Steels are large and complete. Even though the continuing strong demand still depletes a size here and there, you will find carbon steels, alloys, stainless—everything you need—on hand for quick shipment from your nearby Ryerson plant.

So call us whenever you need steel or have any question regarding what steel to use or how to fabricate it. Our experienced steel men will be ready to help you—and we can promise you prompt, dependable service.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished

STRUCTURALS—Channels, angles, beams, etc.

PLATES—Many types including Inland 4-Way Safety Plate

SHEETS—Hot & cold rolled, many types & coatings

TUBING—Seamless & welded, mechanical & boiler tubes

ALLOYS—Hot rolled, cold finished, heat treated

STAINLESS—Allegheny bars, plates, sheets, tubes, etc.

REINFORCING—Bars & Accessories, spirals, wire mesh

BABBITT—Five types, also Ryertex plastic bearings

MACHINERY & TOOLS—For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

 (*Continued from page 69*)

Tungsten Ore Supply Exceeds Consumption

In its quarterly report on tungsten covering the third quarter of 1953, the Bureau of Mines observes that domestic production of concentrates exceeded U.S. consumption for the first time since the third quarter of 1949 when consumption was only 317 tons.

A summary of the second- and third-quarter statistics, in short tons of 60% WO_3 follows:

	Second Quarter	Third Quarter
U. S. production	2,252	2,102
Mine shipments	2,237	2,057
Imports (a)	7,973	7,676
U. S. consumption	2,300	1,876
Stocks at end:		
Consumers-dealers	2,726	3,769
U. S. producers	302	350
	3,028	4,119

(a) Imports for consumption.

Domestic production of tungsten concentrates declined 150 tons (reduced to an equivalent of 60% WO_3) in the third quarter. Labor trouble at the Pine Creek property in California accounted for much of the loss.

A bill to extend the termination date of purchase programs to stimulate domestic production was signed by President Eisenhower on Aug. 7. This extends the termination date on domestic tungsten to July 1, 1958 or until 3-million units have been purchased, whichever occurs first.

Consumption of tungsten concentrates in the third quarter was 18% less than in the second quarter. Distribution of the quantity consumed in the July-Sept. period was as follows: Manufacturers of steel ingots and ferrotungsten, 35%; manufacturers of hydrogen-reduced metal powder, 45%; manufacturers of carbon-reduced metal powder, tungsten chemicals and miscellaneous products, 20%.

Imports for immediate consumption in the third quarter of 1953, by countries, according to the U.S. Department of Commerce:

Country:	Gross Weight Pounds	W Content, Pounds
Argentina	110,139	60,280
Australia	583,786	288,824
Belgian Congo	120,780	67,300
Bolivia	2,672,399	1,325,124
Brazil	900,014	493,872
Br. Malaya	11,219	5,339
Burma	280,000	153,526
Canada	1,546,499	479,827
Egypt	2,354	1,232
France	292,377	154,111
Germany (West)	97,479	53,150
Hong Kong	.....	.....
Korea, Rep.	2,999,799	1,447,189
Mexico	459,724	160,544
New Zealand	67,690	36,396
Peru	322,563	178,477
Portugal	989,457	558,880
So. Rhodesia	151,888	81,840
Spain	1,729,679	935,663
Thailand	533,897	298,017
Union So. Africa	23,615	10,857
United Kingdom	50,000	26,351
Yugoslavia	34,943	17,735
Totals	13,980,301	6,834,534

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

Dec. 31, 1953

Aluminum ingot, 99 plus percent, lb.	21½¢.
Antimony, spot, lb., 5 tons and up but less than carload, packed in cases	31.97¢
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb.	$2.60
Germanium, lb.	$295.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	60¢.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	27¢.
Palladium, troy oz.	$22.00 @ $24.00
Platinum (Official quotation wholesale lots) troy oz.	$91.00 @ $93.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$187 @ $189
Selenium, 99 plus percent, lb.	$4.25 @ $4.75
Silicon, minimum 97 percent, carloads, lb.	18½¢.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 plus, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per unit	$46.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $32.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $54.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer (b)	$10.30
Mesabi bessemer (b)	$10.05
Mesabi, non-bessemer (b)	$9.90
Lead (Galena), 80 percent, Joplin, Mo., ton	$166.50
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties $1.08 @ $1.10 c.i.f. U. S. ports, duty extra. Long-term contract nominal at 90c. to 93c., c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60¢.
Tantalite, 60% concentrate, per lb.	$2.50 @ $3.00
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, c.i.f. U. S. ports, duty extra	$24.00 @ $25.00
Domestic, scheelite, 60 percent f.o.b. mill	$63.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31¢.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$56.00

(a) F.o.b. port of shipment. (b) Effective July 1, 1953.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½¢.
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb.	$1.96 @ $1.97½
Copper Sulphate, 100 lb.	$10.35
Germanium Oxide, lb.	$142.00

ALLOYS

Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾¢.
Ferromanganese, 74–76%, net ton, seaboard	$200
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent per lb. of contained Si.	12.4¢.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$4.10
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, lb. per contracts	11.4¢.
Spiegeleisen, per long ton, 19 @ 21% grade	$86.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):	
Spinning fiber, 3-K	$436
Shingle fiber, 4-K	$185
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $63.00
Barytes, f.o.b. cars:	
Georgia, crude, per ton	$14.00
Missouri, 94 percent $BaSO_4$, per short ton	$13.25
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.05
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective ton	$42.50
60% effective CaF_2	$38.00
Acid 97% concentrate, bulk, ton	$57.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$38.00
Mica—Domestic, f.o.b. mines. Punch 12 to 22¢. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 70¢. to 85¢.; 2 x 2 inch, $1.10 to $1.60; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $32 and up.	
Ocher, Georgia, ton, in sacks	$30.00
Pyrites, Spanish, per long ton unit of S. c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$25.50 @ $27.50
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces	$56.00
Steel f.o.b. Pittsburgh, billets, net ton	$62.00
Structural shapes, 100 lb.	$4.10 @ $4.15

Announcing
Major Advance in
Tractor Design!

New Caterpillar oil-type flywheel clutch

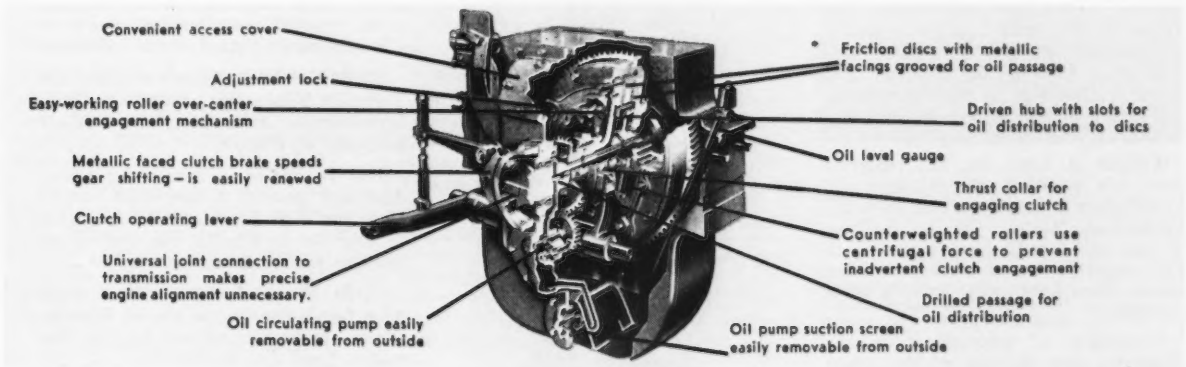
now standard in the D8, D7 and D6!

Once again Caterpillar leads the field in an advance that boosts production, cuts down time and lowers operating costs. The new oil-type flywheel clutch, now standard in the Cat* D8, D7 and D6 Tractors, means a new high in money-making performance for you from these three rugged machines. Exhaustive on-the-job tests prove that this clutch lasts many times longer than other clutches under *identical* conditions. They also prove it enables you to run these tractors two to four times longer before making clutch adjustments.

Here's how it works. The oil system is entirely separate from that of the engine. While the engine is running, the oil pressure flows to all working parts of the clutch. Oil is fed constantly through the radial and circumferential grooves in the friction discs even when the clutch is engaged, thus cooling the friction discs and pressure plates at all times. As a result, there's minimum opportunity for wear and heating to take place. That's why adjustments are very seldom needed and disc replacement normally required no more often than engine overhauls. For easy access, the clutch has a dirt-proof housing with a big opening at the top—a mechanic doesn't have to disturb engine or transmission to get at it.

Get the whole picture from your Caterpillar Dealer. Remember, he backs all sturdy yellow equipment with genuine parts service—there's never an "orphan" in the Caterpillar line. Ask him to demonstrate on the job!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.


Convenient access cover
Adjustment lock
Easy-working roller over-center engagement mechanism
Metallic faced clutch brake speeds gear shifting—is easily renewed
Clutch operating lever
Universal joint connection to transmission makes precise engine alignment unnecessary.
Oil circulating pump easily removable from outside
Friction discs with metallic facings grooved for oil passage
Driven hub with slots for oil distribution to discs
Oil level gauge
Thrust collar for engaging clutch
Counterweighted rollers use centrifugal force to prevent inadvertent clutch engagement
Drilled passage for oil distribution
Oil pump suction screen easily removable from outside

New Caterpillar oil-type flywheel clutch gives you greater dependability and lower service and maintenance costs than any other clutch under identical conditions, normal or tough.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

PERSONAL NEWS

PHILIP M. McKENNA, president of Kennametal Inc., Latrobe, Pa., was awarded the Holley Medal by the American Society of Mechanical Engineers for "the development and application of cemented carbide compositions . . . revolutionizing the art and science" of drilling and metal cutting. Mr. McKenna, who is chairman of the Gold Standard League and an authority on monetary economics, was also selected to deliver the Towne lecture.

W. Howard Winn was appointed smelter superintendent of the Chino Mines division of Kennecott Copper Corp. Another move made in the organization was that of **Wesley Dow**, to assistant smelter superintendent. Mr. Winn succeeds **E. A. Slover**, new assistant general manager at Chino.

Thaddeus S. Ullman, assistant export manager of the EIMCO Corp., has been promoted to export manager. Mr. Ullman will continue to make his headquarters in the EIMCO Building, New York City.

Carl O. Hoglund has been named pit foreman at the Mountain Iron mine and **Vernon W. Johnson** and **Victor F. Rozinka** as pit foremen at Rouchleau, in the eastern Mesabi district of Oliver Iron.

William D. Lord, Jr., has resigned from his position as manager of mines after 6 years' service with International Mining Co. in Bolivia. He and his family have returned to this country for a short vacation before Mr. Lord will seek a new position.

A number of promotions in the Minnesota Ore division of the Jones & Laughlin Steel Corp. have been announced by **Harry F. Kullberg**, manager. **Paul Kruse**, superintendent of the Columbia, Schley and Wentworth mines, to Eastern district superintendent; **John F. Linden**, to district superintendent, Western district; **Clarence H. Sleeman**, assistant to the manager; **H. W. Gillespie**, former assistant superintendent of Schley-Petit mines, to superintendent; and **William Ball** to superintendent at Longyear.

Harry Swem has been appointed vice president of Texas Gulf Sulphur, New York City.

William G. Jewitt, assistant general manager and manager of mines for Consolidated Mining and Smelting Co. of Canada, Ltd., received the honorary LL.D. at the recent convocation which marked the opening of the University of Alberta's new engineering building.

Tom Lyon, nationally identified with the fields of mining and metallurgy for more than a quarter of a century, and until recently with the DMPA, has joined Southwestern Engineering Co., of Los Angeles, in the capacity of consulting engineer.

Denys S. Lawrie, graduate of the Royal School of Mines, in England, is in Northern Rhodesia with the Anglo American Corp. at Kitwe.

Glen S. Wyman has been appointed general superintendent at Chuquicamata. **L. E. Fish** succeeds him as superintendent at the Chile Exploration Co. operations.

Ian M. McLennan, general manager of Broken Hill, has been appointed a director of the Australian firm.

Alan Gibson, senior geologist, Mount Isa Mines, has joined the South Australian department of Mines.

Clyde E. Weed and **Edward S. McGlone** have been elected president and vice president, respectively, of Green Cananea Copper Co., an Anaconda subsidiary.

Henry R. Colen, formerly of New Jersey Zinc, at Gilman, Colo., has joined International Minerals and Chemical Corp., Columbia, Tenn., as mining engineer.

M. L. Fitzgerald has left Australia for Kitwe, Northern Rhodesia, where he will serve as senior metallurgist, Rho-Anglo Mines Services. Mr. Fitzgerald was manager of Lake Chandler alunite project for several years.

LEO F. REINARTZ, Armco Steel Co. vice president, of Middletown, Ohio, will serve as president of the AIME in 1954. Mr. Reinartz served as vice president of the AIME from 1945-48 and in 1952.

EDWARD I. WILLIAMS, president of the Riverton Lime and Stone Co., of Riverton and Piney River, Va., was elected president of the Virginia Manufacturers Association at that group's annual meeting in November.

Boris V. Lubienski is mill superintendent at the Empresa Minera San Jose, Oruro, Bolivia.

D. K. Robinson, recently with the Camborne School of Mines, England, is with Sungei Besi Mines, Selangor, Malaya.

Dr. Frank L. Stillwell has retired from the CSIRO Mineragraphic Section, Melbourne, Australia. He joined the council in 1927.

Oscar Davila Michel has left the Castrovirreyna Metal Mines Co. in Lima, Peru, to return to his country to do special metallurgical work at Cia Minera de Catavi, Catavi, Bolivia.

Clyde Nettleton, former engineer for Telluride Mines, Inc., Telluride, Colo., is now at the Climax Molybdenum Co.'s property at Climax.

Roy B. Earling, former vice president and general manager of operations for U.S. Smelting, Refining and Mining Co. in Alaska, has opened an office as mining consultant in Seattle.

Clyde Evans, former mining engineer for Howe Sound Co. at Holden, Wash., is now employed by the Bonanza Lead Co. at Colville.

Kenneth L. Tatman, former mill superintendent at the Resurrection Mining Co. mill at Leadville, Colo., is now working as metallurgist for the Idarado Mining Co. at Ouray. Idarado is operated by Newmont.

William E. Mahin, former director of research for the Armour Research Foundation, has been appointed technical director of Vanadium Corp. of America.

DR. KENNETH L. COOK, formerly with USGS, has been appointed associate professor and head of the department of geophysics at the University of Utah. Dr. Cook was also appointed chairman of the Geophysics Subdivision of AIME.

Sherman A. White is general manager for Industrial Minera y Metalurgica de Oaxaca, Oaxaca, Mex.

Dr. George Gerard has been appointed assistant director of the research division of New York University's College of Engineering, it was announced by **Dr. Harold K. Work,** division director.

Lorin L. Ferrall has been appointed assistant vice president and **David I. Dilworth, Jr.** named director of metallurgy of the Crucible Steel Company of America.

Gordon F. V. Anderson has been appointed assistant general manager of Big Bell Mines Ltd., Western Australia.

J. Burns has been appointed chief engineer, Territory Enterprises Pty. Ltd., Rum Jungle, Northern Territory, Australia.

A. E. Waite has been appointed inspector of mines and quarries at Palmerston North, New Zealand.

R. O. K. T. Moodie, former underground manager, Zinc Corporation Ltd., Broken Hill, is now production manager, Riley Dodds Aust. Ltd., at Melbourne.

J. G. Tilmans, who has been employed as tunnel engineer at Kemano, will spend a holiday in his native Netherlands on completion of his contract with the British Columbia mine. Following his holiday, Mr. Tilmans will return to North America.

Dr. Truman H. Kuhn, dean of the graduate school at Colorado School of Mines, left Nov. 25 for Turkey to estimate the chromium reserves in a 36 sq mi area for private interests in Turkey.

Anthony M. Ryerson has resigned from active association with Inland Steel Co. because of ill health, according to an announcement made Dec. 2. Mr. Ryerson remains a member of the company's board of directors.

J. P. Hall has been appointed to

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THE president approved the engineer's recommendation. A Farval centralized lubrication system was installed on a large rock crusher. Result:

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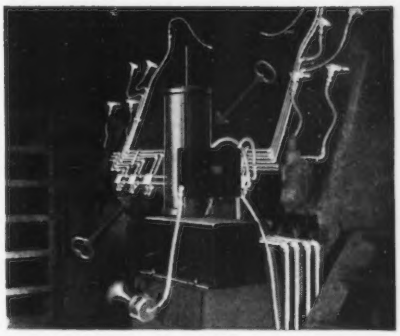

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the California State Mining Board to replace **F. C. van Diense**, of San Francisco, who resigned. The announcement by **Gov. Goodwin Knight** came a week after Mr. Hall's reelection to the presidency of the Western Mining Council, Inc.

Plato Malozemoff, former vice president of Newmont Mining Corp., was elected president of the corporation at a meeting of the directors on Dec. 15. He succeeds **Fred Searls, Jr.**, who was made chairman of the board. **Charles F. Ayer**, former chairman, has retired and was named Honorary Chairman.

A. J. McNab has been elected chairman and chief executive officer of Magma Copper Co., and of its subsidiary, San Manuel Copper Corp. He is succeeded as president of both concerns by **Wesley P. Goss**, former vice president and general manager of the two organizations.

Joseph L. Jordan has been appointed director of public relations for the Los Angeles district of U. S. Steel Corp. The former publisher of the *Duluth Herald* and *News Tribune*, he has been director of public relations for the Northwest District of the company since 1941.

Joseph M. Gambatese, formerly Washington labor editor for McGraw-Hill magazines, including *E&MJ*, has joined the General Electric Co. as a consultant in employee relations. Mr. Gambatese has been labor editor for the magazines in Washington since February 1946.

Blair T. Burwell has resigned as superintendent of the Cayia mine at Crystall Falls, Mich., Menominee range, to join the Minerals Engineering Co., Grand Junction, Colo., in association with his father, **Blair Burwell. W. P. Reed** takes over direction of the Cayia mine operation in addition to his present duties as superintendent of the Bristol mines.

Howard H. Rice is with Neptune Gold Mining Co., Managua, Nicaragua.

At the annual banquet of the AIME, to be held next month, the following 50-year members of the institute will be added to the Legion of Honor:

Blow, John J., Barbados, B. W. I.; **Boutwell, John M.**, Salt Lake City, Utah; **Boynton, Arthur J.**, Chicago, Ill.; **Brooks, John M. Jr.**, El Paso, Texas; **Bryant, George W.**, Los Angeles, Calif.; **Cates, Louis S.**, New York, N. Y.; **Channing, R. H.**, New York, N. Y.; **Cobb, H. McL.**, Guanacevi, Dgo., Mexico.

Dakin, Frederick H., Burlingame, Calif.; **Fohs, F. Julius**, Houston, Texas; **Goodale, Stephen L.**, Pittsburgh, Pa.; **Guernsey, F. W.**, Vancouver, B. C., Canada; **Hunter, H.**, Tokyo, Japan; **Jones, Charles H.**, Forfar, Scotland; **Lindsay L.**, Chichester, England.

Mills, Edwin W., Salome, Ariz.; **Paymal, George W.**, Altadena, Calif.;

HUGO E. JOHNSON, prominent research engineer in the iron and steel industry since 1925, has been appointed a vice president of the Lake Superior Iron Ore Association. Mr. Johnson has been assistant manager of project development group of Battelle Memorial Institute.

Pelton, Roger T., La Jolla, Calif.; **Posada, Juan de la C.**, Antioquia, Colombia; **Prout, John W., Jr.**, Beverly Hills, Calif.; **Schroter, George A.**, Brooklyn, N. Y.; **Swanquist, George A.**, El Salvador, Central America; **Wright, Louis A.**, Palo Alto, Calif.

OBITUARIES

William R. Allen, 82, Wise River, Beaverhead County, Montana, head of a number of Montana mining companies and formerly Lieutenant Governor of Montana, died in Butte on Oct. 31, 1953.

Russell B. Caswell, 79, Portland, Ore., died in that city on Nov. 5, 1953. He was president and principal owner of the Ermont Mines, Inc., west of Dillon, Beaverhead County, Mont.

Charles B. Power, 85, Helena, Montana, prominent in Montana business and mining circles, passed away in Helena on Nov. 15, 1953. At the time of his death, he was president of the Faith Mining Co., near Hughesville, Judith Basin County, Mont.

Richard H. Travers, long active in the mineral and metal development of the Southwest, passed away Oct. 22 at his home in Hollywood, Calif.

Charles H. Taylor, 94, oldest member of the Canadian Mining Institute, passed away Oct. 27 at his home in Toronto. Mr. Taylor was a veteran of the Klondike gold rush.

George Ashmun Laird, 80, who retired 25 years ago after many years as a mining engineer in Arizona, Mexico, South America and Australia, died Nov. 18 in Westchester County, N. Y.

Hoval A. Smith, veteran Arizona mining engineer and one-time candidate for U. S. Senator, died in Washington, D. C., on Oct. 29 at the age of 75.

Harold T. Titcomb, 78, who was once consulting engineer for Trepca Mines, Ltd., and in Siberia, and a leading figure on the international mining scene, died Nov. 26 at his home in Farmington, Maine.

Ralph Mickle, 31, employed as a metallurgist at the Herculaneum smelter, was injured in an accident while at work on Nov. 23 and died at 8 am the next day. According to reports, Mr. Mickle had got inside a vibrating conveyor, which he was repairing, and other workmen, not knowing he was inside, started the flow of material through the machine.

A. Gerald Newton, 33, manager of the Fanstone mine construction site north of Colville, Wash., was killed Dec. 3 in a highway accident 12 mi north of Colville. Before coming to Colville two years ago, Newton was employed by the Isbell Construction Co., Reno, in which his father is an officer.

R. F. Feind, a special engineer in Allis Chalmers processing machinery department, died Dec. 4 at the age of 64.

W. H. Losee, widely known mining and metallurgical statistician, passed away in Ottawa in late November. He had retired only one month before his death after 30 years of Canadian government service.

Pope Yeatman, 92, winner of the Saunders medal, and internationally known mining engineer, passed away at his home in Philadelphia Dec. 5.

Charles A. Vignos, 86, president of the American Mine Door Co., of Canton, Ohio, died suddenly at his home Dec. 3. Mr. Vignos was a leading member of the industry and made the personal safety of the mine worker his major concern. His firm developed the electric switch throw and many types of rock dusters.

Emil J. Walli, 47, veteran uranium operator, died suddenly in Toronto. A graduate of Queen's University, he was associated for most of his career with the LaBine interests.

J. B. Von Maltzan, 48, representative of the Continental Ore Corp., of New York, in India, died in a plane crash at Nagpur, India, Dec. 12.

Dan Phillips, 60-year-old Navajo who discovered one of the richest uranium fields in the world, died Dec. 9 in a Shiprock, N. M. hospital, almost penniless.

APPRECIATIONS

Louis Webster Wickes died at his home in Los Angeles September 16, 1953. He was born at Low Moor, Va., and educated at the Massachusetts Institute of Technology and Columbia University. After several years as surveyor and assayer in Colorado and Montana, chemist and mine superintendent, field engineer and mine manager, he joined the office of Seeley W. Mudd and Philip Wiseman before World War I. During the war he serv-

ed as a major in the Engineers in France. After his discharge, he returned to the firm and inspected the property of the Cyprus Mines Corp.

During his association with the Mudd-Wiseman group, Mr. Wickes examined many mining properties in the Western States, Mexico, Southern Europe and the Near East.

This association continued to his death and he served faithfully, honestly and fearlessly, in an advisory capacity on many projects and problems, as treasurer of Cactus Mines, and treasurer and director of Cyprus Mines Corp. His counsel was highly valued by his associates; he was beloved for his keen sense of humor, his forthrightness, his sincerity, his high sense of loyalty to his friends and profession and the thoroughness with which he pursued his business and hobbies. He will be sorely missed.

JAMES L. BRUCE

Cyprus Mines Corp.

David Porter Hale, Jr., metallurgical engineer of the Marcy Mill division of the Mine and Smelter Supply Co., passed away Nov. 3, 1953, while on a visit to Philadelphia.

He entered company employment Jan. 21, 1946, and was a faithful and highly regarded employee. He was the author of a number of technical articles on ore milling and was active in the AIME. He was a brilliant and active metallurgical engineer and he will be hard to replace. His death is a great loss to the company.

C. G. WILLARD

Marcy Mill Div.

Harold Abbot Titcomb, internationally known consulting engineer, died at his home in Farmington, Me., Nov. 26, 1953. A graduate of the Columbia School of Mines, Class of 1898, he began his career in the lead-zinc mines of Missouri. There followed positions and assignments in nearly every mining area in the world.

Mr. Titcomb was awarded the Order of St. Sava by the King of Yugoslavia in 1927 after he reopened a property in Serbia which had not been operated since the 15th century.

Mr. Titcomb and his family suffered a shock in World War II when his son, Capt. John Abbot Titcomb, was killed in action in Luzon, P. I., while serving with the U. S. Marines. Mr. Titcomb himself was a veteran of the Spanish-American War.

His sterling character, and the unique quality of his Puritanical integrity and ethics shone in his daily life, and will live in his record. His standing as an engineer requires no elaboration from me, for it is recorded in the achievements which I have partially listed. In his passing and that of his son Jack, the profession has lost one of its finest strains of high character, exceptional ability and kindly attitude toward others.

HENRY KRUMB

Newmont Mining Corp.

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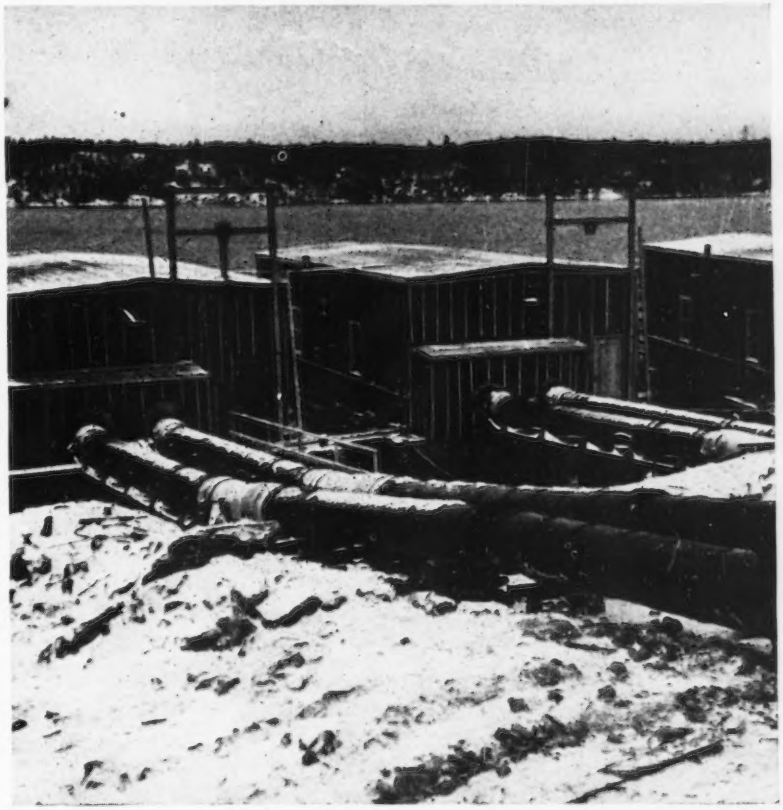

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THIS MONTH IN MINING

COPPER PIT at Weed Heights is 3,000 ft long, 1,500 ft wide and 150 ft deep. Excavation reached this point in 16 months time. Ore is loaded by 5-yd power shovels and trucked to the gyratory crusher at an average rate of 1,000 tons per truck-shift. From there it is smoothly routed to the leaching vats and the smelter.

Yerington Mine Starts Production

TRAVELING UNLOADING BRIDGE works in conjunction with loading bridge at Yerington. The 8-ton clamshell can unload leaching vats at rate of 900 tons per hour.

AFTER TWO YEARS of preliminary work, Anaconda Copper Mining Co.'s $35-million mining and treatment plant at Weed Heights, 81 mi southeast of Reno, is now operating, under the direction of A. E. Millar, general manager.

The latest unit to be completed was the leaching plant at the north end of the company's Lyon County site. First cement copper was produced on Nov. 10.

Functioning smoothly on the shakedown run, the various units worked satisfactorily. When up to full capacity, the plant will produce 65-million lb of copper annually from the less than 1% average oxide copper ores found in the estimated 35-million tons of ore.

To celebrate the occasion, Anaconda management invited about 300 guests to the new plant site for the formal opening Nov. 10. The program included an inspection trip to the pit, the town, the crusher units, leaching vats, conveyor belts, the sulphuric acid plant, and the gigantic loading and unloading bridges and gantry crane followed by luncheon at the company mess hall.

Speakers at the dedication included Robert E. Dwyer, president of Anaconda Copper Mining Company, of New York; Clyde E. Weed, vice president in charge of all Anaconda operations; Chester H. Steele, vice president in charge of western operations and A. E. Millar, general manager of the Yerington mine. Governor Charles H. Russell of Nevada welcomed the company to the state; Senators Pat A. McCarran and George W. Malone also addressed the guests.

Transition of the district from sagebrush-covered barren land to a site of teeming human and mechanical activity in only two years, is nothing short of miraculous. Already the Weed Heights project of Anaconda has taken its place high on the list of Nevada's industrial enterprises. And this is only the beginning for Yerington.

Ore scooped by electric power shovels in the open pit is transported by

truck to the primary crusher. Here a 54-in. gyratory reduces the ore to minus 5-in. The crusher easily handles from 7,000 to 8,000 tons per shift. From crusher, ore goes to coarse ore storage, which is ample to fill at least one leaching vat. Under present operating schedule, the primary crusher will operate two shifts only, six days weekly.

From the coarse ore storage the minus 5 in. material is conveyed to the secondary crushers. There Symons standard units reduce the material to maximum size of 1½ to 2 in. The material then moves toward three Short-Heads where final crushing to minus ⅜-in. takes place.

The minus ⅜-in. ore travels by conveyor belt along the full length of the eight leaching vats. It is so designed that the material can be transferred from this belt to a feeder belt on the loading bridge, which feeds all the vats.

After the vats have been filled, sulphuric acid solution is pumped to the top of the charge and allowed to percolate down through the ore. Solution is drawn off at the bottom and recirculated for about 96 hr. Controls for varying solution and volume are set at each vat. Vats will hold 11,000 tons of material each.

Once leaching has been completed, the residue is washed to recover any remaining acid, the leached residue is excavated by means of a large grab bucket, transported by the unloading bridge. Leached residue is loaded into trucks and taken to the tailings disposal area.

The copper solution flows to the cementation launders where, by circulating the solution over shredded tin cans, the copper is precipitated. These copper precipitates are then removed from the cementation launders, allowed to dry atmospherically, and then loaded on trucks. These trucks haul the product 12 mi north to the railhead at Wabuska on the Southern Pacific Railroad for shipment to Anaconda, Montana.

16 Months, 16-Million Tons

During the past 16 months Anaconda excavated 16-million tons of material. Some of this material is too low grade for present processing and was stockpiled for later treatment. The greater part was waste, and had to be dumped at the disposal grounds.

Ore is loaded by four 5-yd P&H electric shovels and hauled by Dart trucks of 25 tons capacity each. These trucks haul an average of 1,000 tons of material from the pit each truck-shift. They are powered by 300-hp Cummins engines, and have torque converters.

Benches have been held to 25-ft vertical height, to facilitate selective mining and also as a safety factor. Drilling is done entirely with a Joy rotary drill, which is capable of drilling an 7½-in. hole to a depth of 50 ft in one hour. On the average each drill hole is loaded with 190 lb of powder. Size of blasts and number of holes in each blast vary.

Mining operation at Weed Heights will account for approximately one-fourth of the payroll at the property. At present there are 120 men employed in the mining phase of the big job including shovel operators, oilers, truck drivers, churn drill operators, rotary drill operators, bulldozer operators, pit men and laborers.

Supplementing the Weed Heights operations, but vital to its success, is the supply of sulphur available for conversion into sulphuric acid. This problem was solved by Anaconda two years ago when it acquired from the Texas Gulf Sulphur Co. its Leviathan mine, located in Alpine County, Calif.

Stripping Overburden

Anaconda purchased the mine in 1951 and early in 1952 started developing it as an open pit project. Isbell Construction Co. of Reno was given the contract for stripping off over 19-million tons of overburden, and to date has removed 10-million tons of this material. Anaconda is now mining sulphur ore there with a 1½-yd diesel shovel.

Ore goes to a loading bin, then is reloaded on other trucks for the 56-mi run to Yerington. Wells Cargo has the hauling contract and has transported more than 160,000 tons of ore to the plant stockpile, which is maintained so that sulphur ore will be available when winter snows cut off supply from the mine. Ore contains about 25% sulphur.

At the Weed Heights plant, the ore is crushed and ground and then by means of the FluoSolids process of the Dorr Co., Stamford, Conn., the SO_2 gas is liberated. This gas, cleaned by passing through cyclones, Peabody scrubber and mist Cottrells, is then employed in the making of sulphuric acid in the Chemical Construction Co.'s contact acid plant. Approximately 450 tons of H_2SO_4 will be required per day in the leaching of the oxide ore.

Wells Cargo has 35 drivers on the Leviathan sulphur mine run to Yerington, with a total payroll weekly of $6,500. The company uses 18 trucks for the haul, making at peak capacity as many as 82 trips a day over the round trip of 112 mi.

The Peterbuilt and Mack cabs and chassis are equipped with 275 and 300 hp Cummins engines. Tractors pull a 35-ft trailer, making a combined length of 54 ft and weigh 28,-

(Continued on page 166)

News Highlights

Preview of program for AIME's national convention next month in New York City. **Page 118.**

AEC geologist is optimistic about the Colorado Plateau's long-range uranium potentiality. **Page 123.**

Day Mines Inc. is pushing development on a new level at its Hercules Mine. **Page 124.**

Minerals Engineering Co. has completed its new 300-ton tungsten mill in Beaverhead County, Montana. **Page 131.**

M. A. Hanna plans an extensive stripping program this winter at its Minnesota operations. **Page 131.**

Manganese Ore Co.'s plant at Henderson, Nev., damaged by fire last summer, is expected to resume production early in 1954. **Page 132.**

Chewelah Copper Co. plans to install a 200-ton mill on Eagle Mountain near Chewelah, Wash. **Page 140.**

GSA has announced that it will buy 18.7 lb of refined copper from the Holden Mine of Howe Sound Co. **Page 144.**

Canada's newest copper-nickel mill has begun operation in Ontario. **Page 146.**

American Potash & Chemical Corp. is offering lithium ores from a new source in Africa. **Page 152.**

South Africa's largest uranium plant has been opened officially at the Western Reefs Mine. **Page 154.**

Texas International Sulphur Co. plans to erect a plant for extraction of crude sulphur, using the autoclave process, in Baja California. **Page 156.**

National Lead Co. reportedly expects to start production of lead concentrates in its mine of Castano Viejo in Argentina this year. **Page 158.**

Australian mines are going ahead with expansion plans despite drop in the prices of metals. **Page 162.**

Commercial quantities of perlite have been discovered in New Zealand. **Page 164.**

New equipment worth about $3-million is being installed at iron ore mines in Sirigao, Portuguese India. **Page 166.**

Mighty Arguments Liven Up Future Resources Conference

BRISTLING WITH MINORITY REPORTS and dissenting opinions, the record of the three-day "Mid-Century Conference On Resources For The Future," held in Washington, D.C., Dec. 2, 3, and 4, bulges with argument but yields few new conclusions.

Not that it was supposed to—the sponsor, Resources For The Future, Inc., a non-profit corporation, posed three questions as basic to the conference:

1. Will natural resources be critically short over the next 25 years?
2. Should industry, government, and citizens get together to do something about it?
3. Do we know enough about U.S. resources and related technology to do intelligent planning in that field?

In seeking answers, the Conference was supposed to "record no votes, approve no resolutions", but simply to "block out areas of agreement and disagreement." In two and a half hectic days of discussion, this was done.

Who's Back of It?

Resources For The Future, Inc. is a non-profit corporation financed by the Ford Foundation, the agency set up by a bequest of Henry Ford's to sponsor such projects, within certain limits, that seem desirable for the welfare of the U.S. and its citizens. A speaker outlined the Ford Foundation's objectives as "doing for the social and economic health of the people what the Rockefeller Foundation has done for their physical health."

Resources For The Future Inc. owes its start to the Paley Report, a document produced under the direct supervision of many of the Ford Foundation's staff. The corporation will make grants of funds, conduct studies, issue publications, and conduct conferences, all with the objective of seeing to it that adequate provision is made to secure needed supplies of raw materials of all kinds in the future.

Horace M. Albright, president of U.S. Potash Co., is chairman of the board of Resources For The Future, Inc., and Reuben G. Gustavson is president.

Helping Domestic Mines

Problems of domestic mining got attention at Section IV of the Conference, Evan Just, vice-president of Cyprus Mines Corp., chairman. About 70 conferees from industry, government, and labor unions spent two days discussing aid to domestic mining through tax incentives, revision of the land laws, and tariff protection or direct subsidy.

In general, the group seemed most nearly united in favoring tax revisions such as removal of the present $75,000 limitation on expensing exploration costs for tax purposes. The group favored holding depletion allowances at present levels, although a representative of a labor union called for elimination of depletion allowances and all other special tax treatment of mining. He favored subsidies as a substitute.

Revising Land Laws

Revision of the land laws to allow broad claim-holding, without the present discovery requirement, to permit geophysical prospecting was agreed upon as beneficial, but little else in this area won general approval. Even the suggestion that the group favor a study of the land laws (written in 1872) with a view to modernizing them, did not gain acceptance. The majority of those present seemed to oppose any extension of the leasing system.

Discussion in the session on direct aids to mining centered finally on two plans: one, a proposal to pay a subsidy to domestic producers of lead and zinc of half the amount by which the prices of these metals fell below an agreed-upon "economic" level; the other, to levy a tariff on imported metals whenever the price went below a "fair" level and to pay it directly to the domestic producers of the metal. No conclusions were reached, except that the group showed agreement in opposing import quotas for metals.

Importing Metals

In Section VI, the only other one of direct interest to mining, Simon D. Strauss, American Smelting & Refining Co., and H. DeWitt Smith, Newmont Mining Co., aided discussion as chairmen of two conference subsections.

In regard to mineral imports, the group agreed that U.S. policy in this field is liberal and should be continued, with possible exceptions in the cases of copper, lead, zinc, and oil.

The group, in general, felt that private financing ought to take the lead in developing mining enterprises abroad, but that government also had an important role.

On market stability, all agreed that stable markets for metals would be desirable, but few agreed on how to achieve it. The group did unite, however, in opposing government stockpiling as a market stabilizing device. There was no great enthusiasm for setting up international buffer stocks. as was suggested in the Paley Report, issued by the President's Materials Policy Commission.

THEY'RE BLASTING AGAIN AT CHUQUICAMATA. Mining is again being carried on at the Chuquicamata Mine, in Chile. Settlement of the seven weeks' strike came as November ended. At press time, Chilean copper was once again being sold in quantity to U. S. consumers, with initial sales based on 30c delivered, equivalent to the current U. S. market price at the time of the settlement.

First Uranium Oxide Refined In Australia

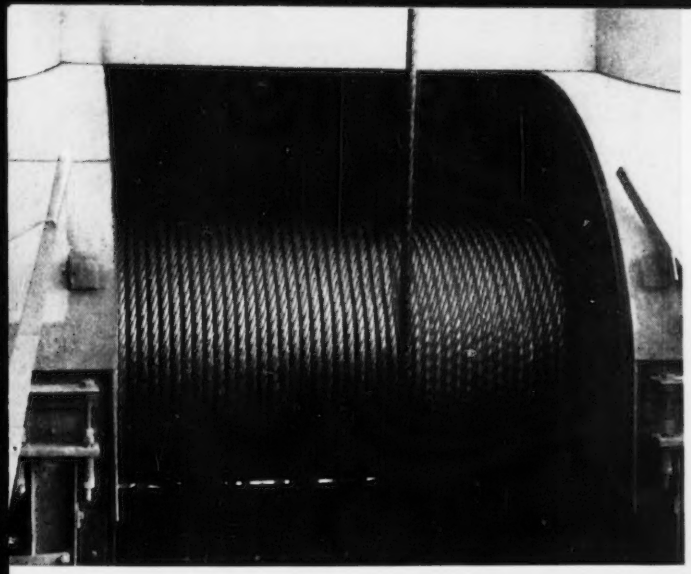
PURE URANIUM OXIDE has been refined in Australia for the first time at a pilot plant at Radium Hill in South Australia and commercial-scale production is expected in the near future in a plant shipped from the United States.

Commercial production may start early in the second half of 1954 and a large uranium refining plant has been shipped from the United States Atomic Energy Commission as part of a plan to cooperate with Australian authorities in the exploitation of Australian deposits of uranium. The cost will be paid from proceeds of sales of uranium to the United States.

The U. S. plant will be erected at Rum Jungle in the Northern Territory of Australia where large deposits of uranium have been discovered and where stocks of ore are being assembled in preparation for treatment.

Report New Deposits Near Cerro Bolivar

NEW IRON DEPOSITS have been discovered some 40 mi west of the Cerro Bolivar in the Venezuelan Guayana. The discovery was made by geologists and engineers of the Cleveland-Cliffs mining company, a subsidiary of Republic Steel.



OVERCOMING ABRASION—Wire rope takes a beating on some jobs by abrasion. It is squeezed in multiple layers under tremendous pressure on rotary drilling drums in the Texas oil fields. In the Northwest it drags under heavy logs.

In this Arizona mine it is scraped over rocks to operate a slusher. Everywhere it is rubbed severely on winches that do not wind smooth. Under such conditions Red-Strand 6 x 19 Seale wire rope will last longer and save you money.

What can you do better with 6x19 Seale Red-Strand?

6 x 19 Seale

6 x 19 Filler Wire

6 x 19 Seale has the same strength and weight as the more frequently used 6 x 19 Filler Wire, but the arrangement and size of the wires is different. You can see in the diagrams that the outer wires are fewer in number and larger in size. They provide *high resistance to abrasion* and greater wearing quality with somewhat less flexibility.

It's the perfect rope for certain jobs. Would it solve a problem for you? Be less trouble? Save more money? A Leschen man is near you. Perhaps he can help. Leschen is providing *longer-than-expected* wire rope service to industry everywhere.

Send for the 64-page Leschen Wire Rope Handbook. It describes Seale and all other Red-Strand wire rope constructions.

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The Watson-Stillman Company
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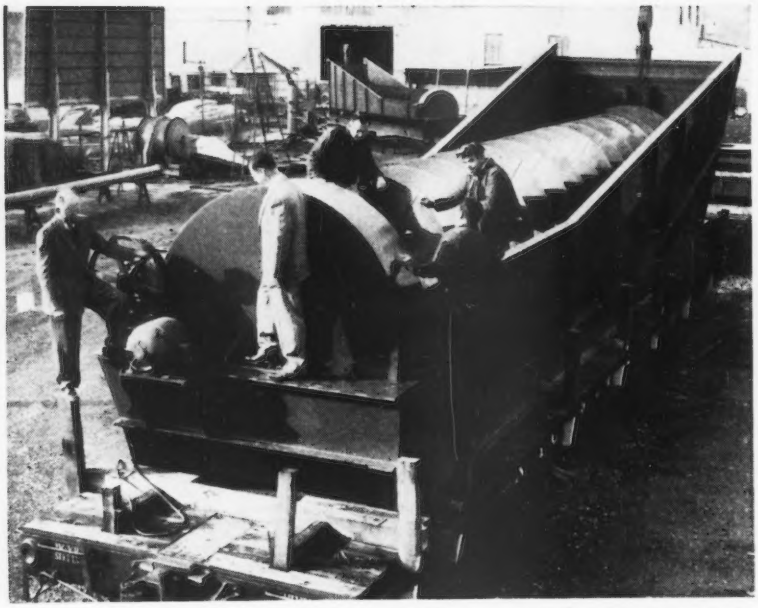

THIRTY-TWO TON CLASSIFIER, above, is prepared for shipment to the White Pine Copper Co. plant (*E&MJ* July, p. 117) under construction near Bergland, Mich. White Pine Copper has ordered 11 more like it from Western Machinery Co.'s factory in Sacramento, Calif. Ray Burk (left), Western Machinery plant superintendent, and Frank Kinsey, production manager, are shown inspecting the giant classifier as workmen apply finishing touches.

Economic Program For Spain Gets Under Way

FOREIGN OPERATIONS ADMINISTRATION announced the first authorizations for commodity purchases under the new $85-million economic program for Spain. The authorizations, totaling $2,010,000, were issued to finance purchases of copper, tinplate, aluminum and strip iron to fill some of the most urgent needs of the Spanish economy. These purchases will be the first under the Economic Aid Agreement signed by the United States and Spain on Sept. 26, 1953.

FOA officials indicated that further purchase authorizations in the $85-million program are now under active negotiation and will be announced shortly.

International Minerals Feldspar Div. Expands

INTERNATIONAL MINERALS AND CHEMICAL CORP. is making substantial progress in expanding its Consolidated Feldspar department, according to industrial minerals division vice president Norman J. Dunbeck.

Three new plants are planned and present equipment is being enlarged and modernized. New units are replacing old and dust collecting and water clarification systems are being installed.

Flotation capacity of Spruce Pine, N. C., has been increased by 50% and new fine-grind facilities at Erwin, Tenn. Mr. Dunbeck also said the quality-control lab at Kona, N. C., has been revised and enlarged for more efficient production.

Speaking of new plants, Dunbeck explained that diamond drilling has been completed on International's extensive reserves of feldspar ore in southern Connecticut, and is underway on the company's nepheline syenite properties in southern Ontario. Plans include a new plant at Blue Mt., Ontario, to be in operation by mid-1954.

Raw Materials Smuggled To Reds Through Beirut

AN INTERNATIONAL GANG is smuggling strategic raw materials from Beirut, Lebanon, to states behind the Iron Curtain it is reliably reported in Beirut. These shipments leave Beirut as if exported to other free countries. Shipments of 1,000 tons of aluminum and 500 tons of copper reached a port on the Black Sea after leaving Beirut allegedly for Antwerp. This was discovered through an international control bureau, established by the Western Powers to watch the distribution of strategic materials.

The aluminum and copper shipments were received in Beirut addressed to a Lebanese firm and stored in the free customs zone. They were then taken aboard a ship ostensibly sailing to Antwerp. The international body started its investigation when the Lebanese firm denied any knowledge of the transaction, having neither imported nor exported such shipment. It was discovered that the origin of the shipment was France, it was shipped to Italy then to the Lebanon and from there to a Black Sea harbor, for final delivery behind the Iron Curtain.

Mining Calendar

Annual Minnesota Symposium on Mining, Duluth, Jan. 11-13

Colorado Mining Association, Shirley Savoy Hotel, Denver, Jan. 28-30

AIME National Convention, Hotel Statler, New York City, Feb. 15-18

Michigan Engineering Society, Jackson, Mich., May 7-8

Kaiser Aluminum Sells Shares to Kennecott

ANNOUNCEMENT WAS MADE Dec. 18 of the sale of $16,250,000 par value of a new series of convertible preferred stock to Kennecott Copper Corp. by Kaiser Aluminum and Chemical Corp., for investment. Kennecott is also buying 100,000 shares of Kaiser common stock from the company's founders, who are selling in proportion to their ownership interest in the company.

The stock purchase notes the first action in the aluminum industry by the large copper manufacturing company.

Republic Steel Contracts To Develop Peru Area

REPUBLIC STEEL CORP., Cleveland, has contracted with Pan American Commodities, S. A., of Lima, Peru, for development of 30,000 hectares of potential iron ore lands. The lands are in the Andean foothills, above the Acari River valley, some 60 kilometers east of the 600 square kilometer iron ore concession now being developed by the Marcona Mining Co.

Aero Service Corp., of Philadelphia, had carried out an airborne magnetometer survey of the coastal area in the Departments of Ica and Nazca with a view to locating potential ore lands for Pan American Commodities and the survey resulted in the discovery of the Acari deposits. The deposits lie within 15 kilometers of the Pan American highway, southeast of Lomas, at an elevation of about 3,000 ft.

Superficial geological surveys indicate that the Acari deposit is superior in iron content to Marcona iron ore, which runs above 60%, but the depth of the deposit is still to be determined.

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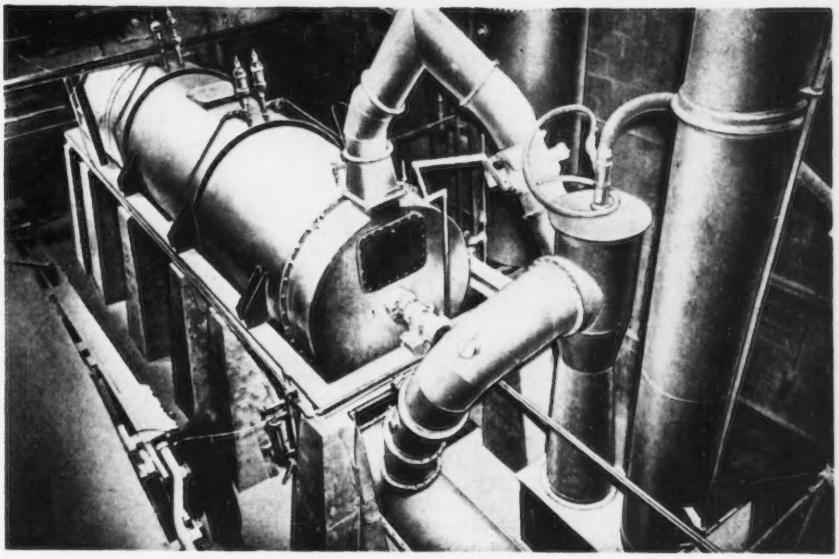
Produces High Quality, Extremely Uniform Hydrated Calcitic and Dolomitic Lime With Virtually 100% Hydration.

A development of far-reaching importance to the entire lime industry. Complete equipment now in operation at Lee Lime Corporation plant, Lee, Mass.

Continuous, non-pressure operation that hydrates virtually 100% of the magnesium content of the feed. Produces exceptionally uniform quality lime, in capacities to suit your requirements.

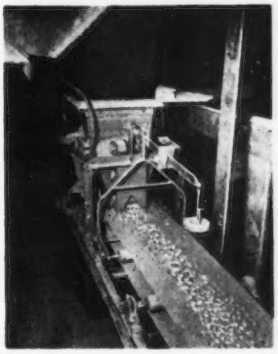
Revolutionary type heat exchanger creates catalytic effect. Lime produced in KVS rotary kiln is fed to hydrator at adjustable rate. Correct proportioning of water is accomplished with the use of control instruments.

The complete system engineered and built to rigid specifications by KVS presents a flexible arrangement of units to fit various plant layouts. Can be readily assembled for use to hydrate either high calcium or dolomite limes.



Kennedy Hydrator for Dolomitic or Calcitic Lime

High-speed mixer at plant of Lee Lime Corporation, Lee, Mass.



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Program, Awards For AIME Annual Meeting Announced

PLANS FOR THE 1954 ANNUAL MEETING of the AIME, in New York have been announced. The program, covering the five-day session, follows:

SUNDAY, FEB. 14

Afternoon session — Characterization of the Mineral Industry Field; MIED Reception and Buffet Supper.

Evening session — Characterization of the Mineral Industry Field.

MONDAY, FEB. 15

Morning session — Drilling Problems; Base Metal Deposits; Chemical Raw Materials (Fluorspar Symposium); General Business Session; Mining Methods in Relation to Recovery.

Noon — Welcoming luncheon, Dr. Grayson Kirk, president, Columbia University.

Afternoon session — Drilling Problems; Stratified Mining; General Session; Ceramics, Raw Materials; Fillers, Fibers and Pigments; Mineral Aggregates; Cement, Lime and Gypsum; Materials Handling; Preparation, Coarse Coal.

Evening — Cocktail Party (New York Mining companies, hosts); Dinner-Smoker, Stag dinner and entertainment by Latin Quarter show.

TUESDAY, FEB. 16

Morning session — Block Caving; Radioactive Materials; Geophysics; Careers in Industrial Minerals; Rare Minerals; Crushing and Grinding; Mill Operating Control; Preparation, Fine Coal.

Noon — Mining, Geology and Geophysics Division Luncheon; Coal Division Luncheon; Institute of Metals Luncheon.

Afternoon session — Mining; Geology; Geophysics; Rare Minerals; Solution and Precipitation; Concentration Committee; Mining Methods.

Branch Cocktail Parties and Branch Dinners. Mining Branch, dinner speaker, Desmond F. Kidd; Metals Branch, dinner toastmaster, K. C. McCutcheon; Petroleum Branch, party and dinner.

Evening — Informal Dance.

WEDNESDAY, FEB. 17

Morning session — Minerals Beneficiation Division "Scotch Breakfast."; Mining; Geology; Geophysics; Special Sands and Abrasives; Concentration Committee; Solids-Fluids Separation; Continuous Mining.

Noon — Industrial Minerals Division Luncheon; Extractive Metallurgy Division Luncheon.

Afternoon session — Underground Mining Problems; Porphyry Copper Deposits; Geophysics; Special Sands and Abrasives; Pyrolysis and Agglomeration; Air and Water Pollution; Strip Mining.

Evening — Annual Banquet and President's Reception.

THURSDAY, FEB. 18

Morning session — Support of Mine Workings; Industrial Waters; Geology; Geophysics; Industrial Minerals Division; Grinding Symposium; Coal Utilization.

Noon — Minerals Beneficiation Division Annual Luncheon, Don Scott, toastmaster.

Afternoon session — Industrial Waters; Geology; Geophysics; Industrial Minerals Division; Minerals Beneficiation Division; Coal Utilization.

Presentation of the following awards for outstanding service and distinguished achievements in their respective fields will be made at the Annual Meeting of the Institue:

Anthony F. Lucas Medal to Bruce H. Sage, associate professor of Chemical Engineering, California Institute of Technology, in the field of petroleum research.

James Douglas Medal to W. J. Kroll, in the field of nonferrous metallurgy.

William Lawrence Saunders Medal to Simeon S. Clarke, general superintendent, Tri-State Mines, Eagle-Picher Co., in the field of mining engineering.

Charles F. Rand Memorial Medal to Wilfred Sykes, chairman, executive committee, Inland Steel Co.

Erskine Ramsay Gold Medal to Luther C. Campbell, vice president, Coal Division, Eastern Gas & Fuel Associates, in the field of coal mine management.

J. E. Johnson Jr. Award to Robert O. MacFeeters, assistant superintendent of blast furnaces, Lorain Works, National Tube Division, U.S. Steel Corp., blast furnace operation.

Robert H. Richards Award to C. Harry Benedict, in the field of copper ore treatment.

Percy Nicholls Award to Henry F. Hebley, research consultant to the Pittsburgh Consolidation Coal Co., in the field of service to the industry.

Robert W. Hunt Medal and Award to J. B. Wagstaff, J. F. Elliott and R. A. Buchanan, in the field of blast furnaces.

Mathewson Gold Medal to E. S. Machlin, assistant professor, School of Mines, Columbia University, and Morris Cohen, professor of physical metallurgy, Massachusetts Institute of Technology, for three papers on the Martensite Transformation.

Rossiter W. Raymond Award to Stanley F. Reiter, research associate, General Electric Co., in the field of carbon steel.

Howe Memorial Lecturer, 1954, C. D. King, chairman engineering committee, U.S. Steel.

Institute of Metals Division Lecturer, 1954, Bruce Chalmers, professor of metallurgy, Harvard University.

Jackling Lecturer, 1954, Reno H. Sales, chief geologist, Anaconda Copper Mining Co.

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IN 1953

IN PITTSBURGH, PENNSYLVANIA...
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IN TULSA, OKLAHOMA...
Leo C. King, The Happy Company

IN EASTON, PENNSYLVANIA...
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IN 1880

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The mammoth belt pictured above stood too high on its freight car to pass through many of the railroad tunnels and underpasses en route to its West Virginia destination. Boston Men rolled up their sleeves . . . teamed up with railroad freight traffic experts . . . pored over maps and timetables. As a result, the giant was rerouted many miles, but it wasn't late for its installation.

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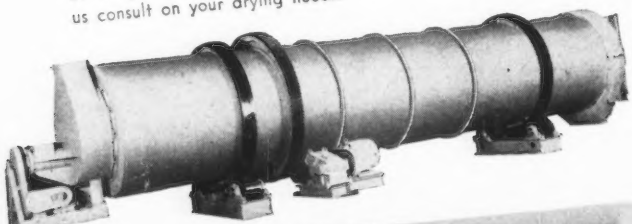

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IN THE U.S.

ALABAMA

● **Prospecting for new deposits of brown iron ore** in the area of Columbia in Houston County is under way following discovery of a vein of high-grade ore near Columbia. Jackson and Price Mining Co. of Cedartown, Ga. has entered into an agreement for lease of 75 acres from Ed Rogers and his son in the Williams Station community.

Mining operations are to start as soon as the company moves more mining equipment into the site. It is expected that large-scale stripping operations will be undertaken along with core drilling to determine the size of the deposit and quality of ore.

Mining company officials believe that the deposits are extensive enough for four or five years of operations. Since such veins are likely to extend for great distances it is expected that other companies will be attracted to the area.

ALASKA

● **A report from Juneau** said the U. S. Bureau of Mines had a crew of three examining property in the area of the Poorman iron deposit on Prince of Wales Island. The Bureau took 200 tons of ore from the Klukwan iron deposit to Douglas for concentrating and metallurgical testing. Concentrates were to be sent to the Northwest Electro Development Laboratory at Albany, Ore. for smelting research.

● **The lode tin mine** at Lost River with a current payroll of about 100 was reported to be the only tin operation not closed for the winter.

● **The following gold mining activities** were reported from Nome, on the Kougarok area. Axel Johnson and partners worked leased ground on Macklin Creek above Taylor, where one pit showed good values. Mrs. John Kenari did assessment work by drilling on gold-bearing ground on Trinity Creek. In the same area Maurice Kelleher expects to resume mining on a group of claims. Sam Godfrey and associates prospected extensively in the upper Kougarok River district. Godfrey reported that some Fairbanks miners plan to put dragline and bulldozer equipment on Henry Creek. He also reported that Norman and Harold Tweet have overhauled their dredge and will resume digging in June. George Bodis struck a pay streak on Dick Creek in the upper Kougarok district. Lyman Madden plans to resume prospecting on Garfield Creek in the summer.

● **Favorable reports have come** from the Red Devil and DeCoursey cinnabar mines where about 30 men are employed under direction of Paul Soren-

son, according to the Territorial Department of Mines. Other activities reported are that a crew of four men were doing exploratory drifting at Funter Bay nickel-copper-cobalt property. And exploration work by George Roberts at the antimony prospect on Camaano Point, Cleveland Peninsula, where a 70-ft shaft was sunk, was expected to close in November for the winter.

● **Activity on Seward Peninsula** was reported from Nome recently: Frank Whaley and partner, Sterling Montague, will resume their mining work this season. Their activities were shut down for several years but during the past season they repaired and extended ditches and did drilling; Paul Rassmus who has 14 claims on Dahl and Quartz creeks will start bulldozer operations this summer; Houston Alexander mined on left limit of No. 5 Dahl Creek the past season and expects to work again this year; George Waldheim has had successful operations on Atlas Gulch at the head of Quartz Creek. Sluicing operations will begin this spring on claims 11 and 12 on Dahl Creek by Mr. Waldheim who did considerable stripping there the past season.

ARIZONA

● **Bagdad Copper Corp. of Arizona** has lost a court fight to cancel water rights of the U. S. Tungsten Corp. on Burro Creek in Yavapai County. A Federal court decision held the tungsten corporation's rights to 3-million gal. of water a year for mining, milling, and domestic purposes were established prior to Bagdad's.

The copper company claimed no other water is available and it will have to cut mining and milling operations at a cost of $10,000 a year.

Bagdad had established rights to 315-million gal. of water each year. The tungsten corporation takes its water from the creek 7 mi below Bagdad's intake.

● **Mining men play an active role** in the new Arizona Natural Resources Coordinating Council formed to consider and effect ways and means for the wise and efficient utilization of resources of the state. Charles F. Willis, representing the Arizona Small Mine Operators Assn. is one of the vice-presidents.

● **Attorney General Ross Jones** has given an opinion that mineral rights to Federal lands ceded to the state by a Congressional act of 1927 must be reserved to the state upon sale to private ownership. Lands granted the state under an enabling act, however, cede mineral rights to the buyer and may not be reserved.

● **Arizona's lead and zinc production continues to decline,** department of mineral resources figures show. The state production of zinc as of last June was 24,000 tons annually, or

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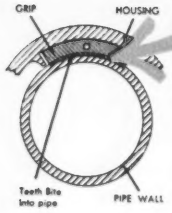

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Why accept less than the best when you are using plain end pipe couplings? Victaulic Roust-A-Bouts are specially engineered to provide the most reliable pipe connections you can use. With inclined, curved grips they bite into pipe circumference—provide a far stronger and surer hold.

Roust-A-Bout Couplings are just what the name implies—reliable, sturdy, adaptable and ingenious—ready for those tough field jobs where only plain end pipe is used or where the simple Victaulic Groove Method is not quickly available.

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- For use on *permanent* piping or *repair* work!
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For your next job—insist on the best—Victaulic Roust-A-Bouts. They're available at all Victaulic Stocking Supply Houses in pipe sizes—2", 2½", 3", 3½", 4", 5", 6", and 8".

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Arizona *(Continued)*

4.4% of the domestic yield. In 1947-51 the state produced 9.1% of the U. S. production. Lead production has dropped from an annual average of 27,162 tons during the peak years to a mere 9,000 tons, according to Frank Tuck, statistician for the department. Importation of foreign products has made lead and zinc mining unprofitable in the state.

CALIFORNIA

● **Max Bechhold,** vice president and assistant general manager of the Idaho Maryland Mines Corp., Grass Valley, Calif., reports that 62 men, underground and surface workers, have been laid off at the Idaho and Brunswick mines. The layoffs are attributed to the low pegged price of gold, making full operation unprofitable.

COLORADO

● **Callahan Zinc-Lead Co.** after battling a year to keep its Whitepine mine, zinc, lead and silver producer, in operation, has announced closing of the mine, through J. E. Dunn, local superintendent.

Dunn said the company has been doing exploration and development work on a limited basis since last November but this is being stopped. The mine will be allowed to fill with water. Mine had an average payroll of $30,000 a month for the ten years it operated, 1942 to 1952. Production exceeded $15-million.

● **Rico Argentine Mining Co. development work** for the six months consisted of driving 719 ft. of drifts and crosscuts and 35 ft. of raises rehabilitating 400 ft. of tunnel, and drilling 3,414 ft. of diamond drill holes.

This development work made accessible many small blocks of good grade ore. S. B. Hinckley of Rico is manager. Rico Argentine entered into an agreement with the Banner Mining Co. to purchase stock of the Banner Mining Co. for $300,000. Banner has a producing copper mine and mill at Lordsburg, N. M., and is developing a copper mine and building a mill near Tucson, Ariz.

● **Trail Mines, Inc. at Cripple Creek** has continued the development and stoping of its orebody at and above the sixth level of the Cresson. The last high assay reportedly showed 7.80 oz. gold a ton. More than 50 tons a week is being produced. William A. Kyner is president of Trail Mines.

● **A large body of low grade ore** has been opened up in the Chicago Tunnel by the Globe Hill Mining Co., of which Al Konselman of Colorado Springs is president. Harry Allen of Cripple Creek is superintendent. The

discovery marks the first time an ore body has been found in the tunnel, which was first started by Winfield Scott Stratton, in an attempt to find new bonanzas in the northern section of the gold crater area. Stratton and others after him blasted the tunnel into Globe Hill for about 7,000 ft.

● **A new gold strike** reported by Gold Range, Inc. in the old Ward mining district in Boulder County, is said to show rich ore that assays over $1,000 a ton. Strike was made in a new development. Paul Elam, company president, said early assays produced a valuation of $46.20 a ton near the surface—that later work has opened some ore streaks that assay more than $1,000.

● **Miners will still be producing uranium** from the Colorado Plateau when other deposits of A-bomb ore possibly have been forgotten. "That is my opinion, but I am not speaking for the Atomic Energy Commission," said Elmer V. Reinhardt, staff geologist of the Grand Junction AEC operations office.

"We are just neophytes as to what we know about the Plateau," says W. Spencer Hutchinson, Jr., assistant to the manager of the AEC office. "But the possibilities are tremendous. The Plateau will be a far greater uranium producer than anyone ever anticipated. The Plateau surpassed the Canadian production a year and one half ago. And during this past year Plateau production doubled."

In 1947 only 10 employees worked at AEC offices in Grand Junction. Today there are 877, including personnel of the U. S. Geological Survey.

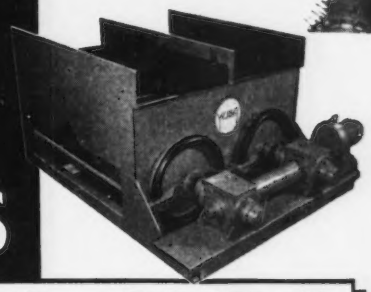
● **Shenandoah-Dives miners have uncovered** a good body of ore in exploratory work under the management of Charles A. Chase of Silverton. New ore is not of sufficient volume or quality to be termed a bonanza but its discovery encouraged residents of Silverton. Shenandoah-Dives Mining Co. was forced to close its mine and big 800-ton mill in March as operating losses mounted monthly, because of low lead and zinc prices. A loan was granted in early July and an exploration program soon got under way consisting of driving about 3,000 ft. of drift and other work to open up for mining what is known as the "Letter G" vein.

● **Colorado Mining Association** has asked the U. S. Tariff Commission to recommend a 50% increase in duties on imported lead and zinc. Also the Colorado delegation urged legislation which would place an "adjustable tariff" on imports of the two metals. R. S. Palmer, Denver, is secretary.

● **A. B. Calloway**, Salida, is opening up the Nellie Bly mine, four mi. from Buena Vista. The Nellie Bly is a free-gold mine from which about $60,000 of ore was shipped between 1925 and 1929. At present he is busy re-timbering the 110 ft. shaft. Since free gold, if it is not roasted, can be sold on open

YUBA Jigs on Biggs No. 3. Note compact arrangement.

INCREASE ORE RECOVERIES



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YUBA Jigs are built to reduce labor costs and downtime. Operating features include:

Interchangeable drives for pulsators completely enclosed and splash lubricated.
Stainless steel stationary hutch valve.
Simplified stroke adjustment (¼" min., 3" max.).
Maximum frequency—400 at ¼" stroke.
Rubber seal between screen grids and basket.
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Install YUBA Jigs in mills and dredges (new or old) to supplement existing equipment or to replace other recovery methods. They require minimum space and headroom; fit in most dredges without hull changes. Built in multiples of 2 or more cells as needed.

For information about adapting YUBA Jigs to your operation, send data on ore, feed sizes and present installation. No obligation.

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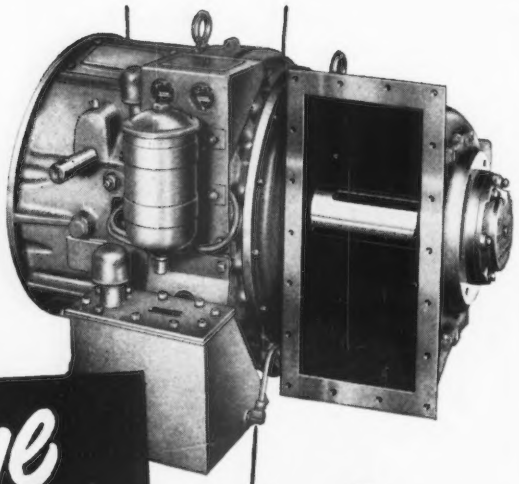
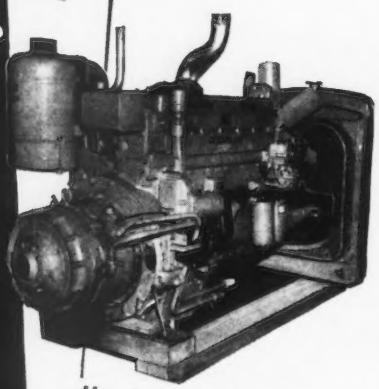


Caterpillar D337 engine (below) equipped with Model CF Torque Converter. Twin Disc Industrial-Type CF Converter (right) available in three sizes, with seven capacities each to handle any type gas or diesel engines from 40 to 1,000 hp.

Torque Converter Drive for your New Power Unit



Here's what the "Twin Disc-equipped complete Torque Converter Power Unit" provides:

- Picks up heavy loads smoothly without slipping the clutch.
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- No mechanical connection . . . drives through fluid action.
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Find out how a small additional investment will return multiplied dollars in greater performance, faster work cycles, lengthened equipment life, easier and more efficient operation . . . with Twin Disc—the Torque Converters that have set the pace throughout industry. Contact your engine dealer . . . today!

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Colorado *(Continued)*

market, Calloway hopes to contract his to a buyer in California.

● **A new uranium mining company,** the Ute Uranium, Inc. is headed by Cripple Creek mining man and mayor of the city, Franklin Ferguson. Test drillings, to locate the Colorado Plateau uranium ore between 175 and 200 ft. below the surface, will be begun in the near future.

● **Three gold bars worth $75,000** were poured recently at the Carlton mill of the Golden Cycle Corp. at Cripple Creek. Total number of bars sent to the mint since the mill started in the spring of 1951 now totals 150, with a total gross value of $3.6-million. Most of the mine production is coming from the Ajax, Cresson and Strong mines. Considerable dump ore is also being milled by the Golden Cycle Corp. Max Bowen of Cripple Creek is manager.

● **Atomic Energy Commission** has issued a new request for bids covering a minimum of 20,000 ft. and a maximum of 30,000 ft. of core and non-core drilling to be performed in the Carlile District, Crook County, in northeast Wyoming. All bids received in response to the previous invitation for drilling in this area were rejected in the interest of the Government. Bid forms and specifications may be obtained from the U. S. Atomic Energy Commission P. O. Box 7647, Lakewood Branch, Denver.

● **Gold is being mined** in the Alma-Breckenridge district by the Cordillera operation on North Star Mountain. Cordillera Co. worked throughout the summer, developing several new strikes made earlier in the year. Harry Dunn of Fairplay is manager.

● **Golden Cycle Corp.** should complete the sinking of its shaft near Uravan to the required 650 ft. depth within a few days, in quest of uranium ore, it was reported. Entire operation will be electrified soon and the present gas-powered hoist replaced with an electric one. A huge air compressor from Cripple Creek has recently been hauled to the Western Slope site near Uravan. A large head frame, which also came from Cripple Creek, will be erected soon.

IDAHO

● **Day Mines, Inc.** is pushing westerly on a three-shift basis on the new 1,600-ft level at its Hercules Mines north of Burke in the Coeur d'Alene Mining District toward the West Hercules ore body, discovered in 1950 and since developed by raise and winze from the 600 to the 1,300 ft level. The ore body lies approximately 3,000 ft west of the new shaft level station and progress toward this objective is at the rate of about 450 to 500 ft a month.

Coppus VENTAIR (centrifugal type)

Coppus VANO (propeller type)

Choose between them and get 30% to 100% more air

Coppus Blowers are designed for two different types of mine ventilation requirements: the centrifugal Coppus VENTAIR is for long pipe lines; the propeller-type Coppus VANO for shorter lines . . . the correct selection will give you from ⅓ more to twice as much air — for a given power consumption — than an ordinary all-purpose fan.

Available for either compressed air or electric motor drive, both can be used as blowers or exhausters and are obtainable in capacities up to 90,000 CFM.

Only Coppus makes both these types, one of which will give you better, more economical mine ventilation . . . know them by the "Blue Ribbon" that symbolizes the engineering and production skill behind every Coppus product.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corporation, Worcester 2, Mass.

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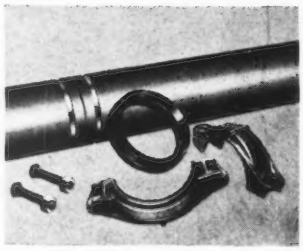
GRUVAJOINTS — for grooved pipe systems carrying pressures up to 500 psi — cost considerably less than ordinary grooved pipe couplings. You get substantial freight savings, too, because **GRUVAJOINTS** weigh up to 45% less than conventional couplings.



Light and trim, **GRUVAJOINTS** are easy to apply and remove; easy to store; can be used over and over. They are made of malleable iron for 2", 3" and 4" pipe — protected with green rust inhibitor.

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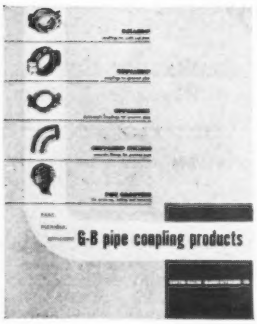

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Idaho *(Continued)*

While the drift work is underway diamond drill holes are being run southerly to probe the main Hercules vein and determine whether the main ore body actually terminated between the 1,000 and 1,200-ft levels as openings on those horizons indicate.

The big Hercules ore body discovered in 1900, was the cornerstone upon which the Day Mines' interests were built. Between the date of its discovery and 1924 the mine yielded $80-million worth of metals, mainly lead and silver, before the apparent bottom of the ore shoot was reached on the 1,200 level.

The property was idle from 1924 until 1948 when it was reopened for further exploration work. Discovery of the West ore body followed and early this year a contract was concluded with the Defense Minerals Exploration Administration for deepening the main shaft to the 1600-ft level and exploring further on this lower horizon. Estimated cost of the project is $242,860.

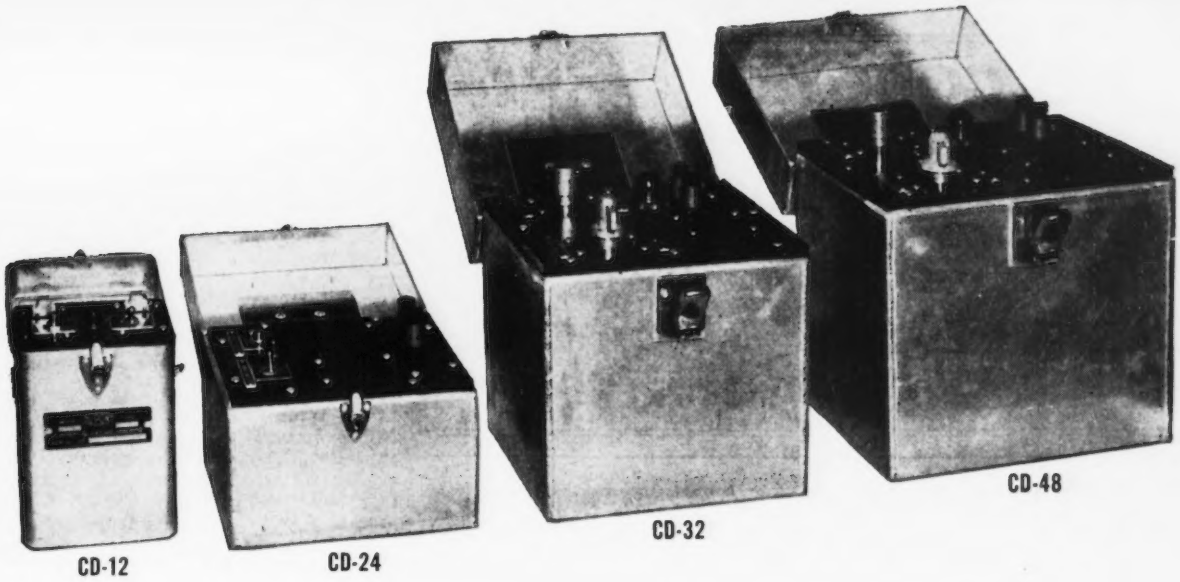
● **Index-Daley Mines Co.** of Salt Lake City suffered a costly set-back in September in its development program at the old Daley Consolidated property on the South Fork of the Boise River, near Mountain Home, when fire swept through the surface buildings. Work on the new development and drainage tunnel has been resumed, however. It is to be driven 4,200 ft to penetrate the area below the old 440-ft shaft at an additional depth of 350 ft, not only opening virgin ground but also providing drainage for the upper workings. Several veins are expected to be encountered before the objective area is reached.

Daley Consolidated property was in production for several years, starting in the late 1880's. Exact production record is not known because the records were destroyed by fire in 1946, but it is reported to have yielded a substantial amount of high-grade gold ore, along with lead, silver and copper.

● **Silver Buckle Mining Co.** has concluded a contract with DMEA for a $229,500 exploration program on Vindicator Silver-Lead Co. property east of Mullan in the Coeur d'Alene District and has made arrangements for financing its 50% share of the costs through Utah mining interests headed by W. H. H. Cranmer of Salt Lake City.

The Vindicator development program will include sinking an 800-ft underground shaft and some 1,700 ft of lateral exploration work at the 750-ft level. Work is expected to be started within a few weeks, under the direction of Clark Wilson, vice president and engineer for the Cranmer interests.

Silver Buckle has an agreement with the Vindicator to develop the latter's property for a 50% interest in any ore that may be found.



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You can fire any conceivable type of blast . . . large or small . . . on the surface or underground . . . with maximum safety, efficiency and economy with Du Pont CD (Condenser Discharge) Blasting Machines—newest development of Du Pont Explosives Research.

Du Pont CD Blasting Machines offer a simple and satisfactory method of firing either primary or secondary blasts. These four lightweight, portable power sources have capacities ranging from 20 holes in straight series to 1200 holes in parallel series. Safety is greatly increased with Condenser Discharge Machines because power *cannot* reach blasting circuits except by the deliberate action of the operator.

These machines eliminate maintenance of permanent firing lines and dependence on motor generators. They have no moving parts, require no physical effort as with mechanical-type machines, and are extremely easy to operate. Long-lasting radio-type B batteries charge the condensers, light up a pilot lamp when they're fully charged. Shots are fired only by turning on a firing switch. Terminals are dead until the instant of firing.

It's easy to fire large or small shots with maximum safety using Du Pont CD Blasting Machines. Ask the Du Pont Explosives representative in your area for complete information about them. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

Characteristics of Condenser Discharge Blasting Machines

Model	Rated Voltage	Capacity with Leading Lines Not Exceeding 3.0 Ohms Resistance			
		Straight Series		Straight Parallel	Parallel Series
		Primary	Secondary		
CD-12 Weight 4 lb Width 4 in Length 5¼ in Height 7 in	120	20	30	NR*	NR*
CD-24 Weight 12 lb Width 7¼ in Length 8¼ in Height 6½ in	240	50	75	NR*	240 (6 series of 40 each) (8 series of 30 each)
CD-32 Weight 22 lb Width 9½ in Length 9½ in Height 10½ in	320	50	125	30	480 (10 series of 48 each) (12 series of 40 each)
CD-48 Weight 27 lb Width 9½ in Length 11 in Height 12¼ in	480	50	200	60	1,200 (24 series of 50 each) (30 series of 40 each)

*NR means not recommended for the purpose.

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In the highly successful operation shown above, a 1-cu. yd. Sauerman Scraper is reclaiming 4-in. gypsum rock at a rate of 33 tph.—average haul 200 ft.

Similar Sauerman installations throughout the country are providing economical storage handling of a wide variety of bulk materials, from acid-phosphate to zinc ore, at rates ranging from 10 to 800 cu. yds. per hour. Storage areas range from a small bin to 10 acres or more.

Pulled forward, the scraper loads. Reversing the forward motion automatically deposits the load anywhere between the tail block and head post. Quick shifting from storage to reclaiming is simply accomplished by unclamping and re-attaching the operating cables so as to turn the bucket around when power is applied. Non-caving or free-flowing materials are handled with equal efficiency.

First cost is reasonable and maintenance expenses remain low year after year, considering the amount of tonnage handled.

Personnel hazards are reduced. The operator can be located in a safe cab overlooking the work area, away from potentially dangerous locations. Many Sauerman installations are remotely operated through air or hydraulic controls.

Let Sauerman engineers show you how to use your storage area to its fullest extent. This service carries no obligation.

For further information send for Catalog E, Bulk Storage by Power Scraper and request the following field reports:

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FR-223 Unloading Systems for Ships and Barges
FR-224 Handling Ore with Drag Scrapers
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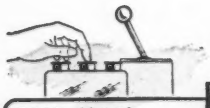
FR-215 Small Area Coal Storage



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Idaho *(Continued)*

Silver Buckle's deal with the Utah firms also includes purchase of two tracts of ground totaling 1,996 acres in the Big Indian District of San Juan County, Utah, site of rich uranium discoveries, including the now-famous bonanza find by Charles Steen in July 1952. The Utah acreage was acquired from New Park Mining company which in return received an option on 1,500,000 shares of Silver Buckle stock, both for the tracts and for providing $50,000 in cash for the Vindicator project. Cranmer is president of New Park.

● **Clayton Silver Mines** has resumed development work on the 550 level at its property in the Bayhorse District of Custer County. The shaft is being deepened another 70 ft or so to provide sump room and sufficient depth for a loading pocket on the new horizon. The shaft was sunk and a 550 station cut in 1952, but no effort has been made to push the development since the company already has sufficient ore broken above the 400 level for several years operation at the present rate. The south ore body can be reached by a short cross-cut on the new level.

● **Wallace and Spokane** interests headed by Barnard Wilcox, Wallace metallurgist and inventor of a new zinc oxidation process, have about completed arrangements for a $200,000 plant in Spokane to utilize the process on a commercial basis. An option has been taken on a plant site and a permit to construct the plant has been obtained from the Spokane County Planning Commission.

The plant will be operated by the newly-organized Northwest Chemical & Refining Co. Arrangements have been made to obtain zinc concentrates from mines in the Coeur d'Alene District.

Process has been developed by Wilcox during the past four years through a series of pilot plant operations at Wallace. It involves burning zinc concentrates on a slag bed in a specially designed furnace at temperatures of 2,200 to 2,600 deg F. Complete oxidation is obtained by means of a series of baffles. The gases are then passed through a cooling flue and the zinc oxide is collected by means of a synthetic fiber bag arrangement in the bag-house.

Pilot plant tests of half-ton batches of concentrates showed a 95% recovery, 70% of which was a prime oxide product and the balance a saleable middling product.

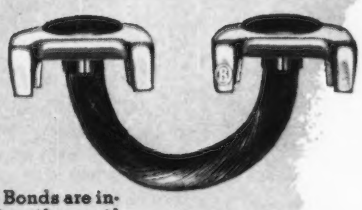
The new Spokane plant is being designed to handle 50 tons of concentrates a day at capacity, and will turn out from 32 to 35 tons of zinc oxide daily.

● **Sunshine Consolidated Inc.** will concentrate its efforts for the next several months on development work at its silver belt property between Wallace and Kellogg. A west drift

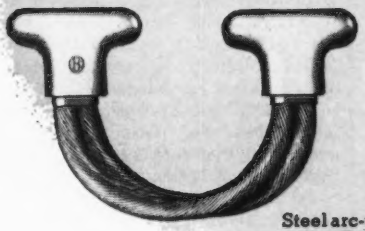
For over or under base installation, the AW-22 is used for spanning joints and for cross-bonding.

One of four bonds applied by steel arc-welding is the AW-20. Other O-B joint plate bonds are mechanically applied or welded with copper alloy

An excellent mechanical bond for permanent or reclaimable use is the O-B Wedge Bond.



AW-19 Rail Bonds are installed under the rail base by steel arc-welding. AW-18 Rail Bonds are copper arc-welded.



Steel arc-welding applies AW-8 Rail Bonds to the rail head. Terminal is designed to minimize possibility of damage from car wheels.

O-B Bonds meet Every Mine Need!

joint plate bonds - cross bonds rail head - over or under base

Two of the bonds shown here — the AW-22 and the Wedge Bond—work out well in several uses, as cross bonds, joint plate bonds, or for over-base or under-base installation. The others serve more specific uses. All five are much-used by repeat customers who know what they need to get track bonded right!

But preferences and requirements change from one mine to the next, and to make sure that you can get the bond that you want for your haulage system, O-B makes more than 16 different types. Some are applied by arc-welding, with either steel or copper. Others are applied by mechanical means.

Look for them in your No. 27 Mining Catalog. Or ask an O-B representative to help select the two or three types that will do the best job for you!

Ohio Brass

MANSFIELD OHIO, U. S. A.

4343-M

Idaho *(Continued)*

on the Yankee Girl vein, 2700-ft level, is in progress on a two-shift basis, and another crew is advancing westerly on the south limb of the vein on the 3100-ft level. The latter drill is in ore.

● **Hecla Mining Co.** has initiated an intensive diamond drilling program on the 2400 ft level at the Hecla-Atlas project east of Mullan in the Coeur d'Alene District in order to gain information as rapidly as possible concerning geological developments between the 800-ft level and the new 2400-ft horizon. Four drills are being operated on an around-the-clock basis, and both horizontal and down holes are being run. Work in exploration headings has been suspended pending completion of the drilling program. Hecla is the operating company under a four-party agreement which includes Atlas Mining Co., owner of the property, and Newmont Mining Corp. and New Jersey Zinc Co., which are sharing the costs of the work with Hecla.

● **Sunshine Mining Co.** has started a new 3850-ft level which will be the deepest in the Coeur d'Alene District —1,150 ft below sea level. A crosscut from the 3850 station of the No. 5 winze has been run to the Sunshine vein and easterly drifting toward the downward extension of the main ore body is in progress.

Preparation of facilities for a 4,000-ft level is also in progress. The station has been cut and crews are now working on an ore-pocket raise.

● **Hope Silver-Lead Mines, Inc.** has started production from a new upper ore body at its property near Clark Fork. The vein, disclosed by surface bull-dozing several months ago, has been opened through a 600-ft tunnel about 400 ft above the old main adit. Three stopes are being worked and a truckload of concentrates is being shipped every week or ten days. Zinc flotation cells were installed in the company's mill in early November.

● **Sunset Minerals Inc.** has sold and transferred all the company's assets to the recently-organized Idaho corporation, Sunset Mines Inc., under a reorganization deal by which the management expects to overcome financial difficulties at the company's Pine Creek mining and milling operation. Effect of the action will be to change the company's stock from non-assessable to assessable.

The new firm will issue a block of its stock in return for Sunset Minerals' assets. These shares will be distributed to stockholders in Sunset Minerals on a pro-rata basis.

Pine Creek operation has been showing a loss for well over a year because of the low lead and zinc prices.

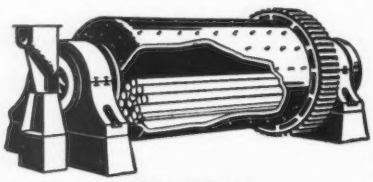
● **Coeur d'Alene Silver Giant Inc.** has entered into a joint venture with other Kellogg mining firms in acquiring an interest in a 30-claim property in the booming Big Indian District of San Juan County, Utah. The property, known as the "Hot Rock," is located about 3 mi northwest of the famous Steen uranium mine and adjoins the LaSal Mining & Development Co. property where bonanza uranium ore was discovered recently through core drilling.

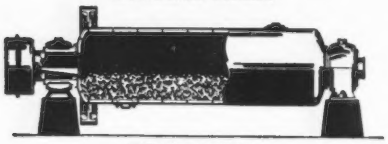
Identity of the firms associated with Coeur d'Alene Silver Giant in the venture and extent of the property interest has not yet been disclosed.

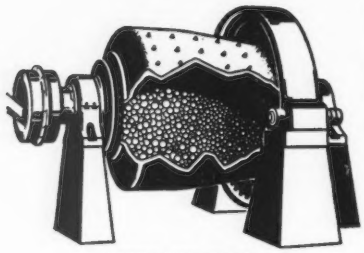
● **Lookout Mountain Mining & Milling Co.'s** south exploration crosscut from the 1200-ft level of the Sunset Minerals Shaft is again underway after a brief suspension of work due to a heavy flow of water encountered in the heading. Water flow was so great that the working level was partially flooded before additional pumps could be installed to handle it. Face of the crosscut is still about 500 ft from its principal objective, the downward extension of the Lookout lead vein.

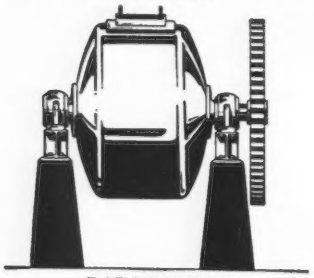
● **Clinton Gunderson and Ira Lambert,** partners in a tungsten operation at the Hanni Mining Co. property on Cliff Creek in Custer County, south

CONICAL MILLS


ROD MILLS


TUBE MILLS


TRICONE MILLS


BATCH MILLS

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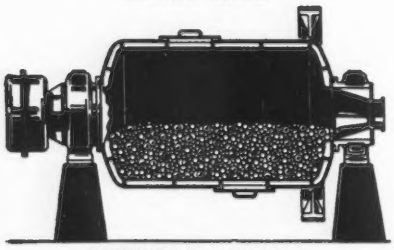
GRINDING MILLS
for
Every Application


CYLINDRICAL MILLS

Write for Bulletin
AH-440-1

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of Mackay, made a 12-ton test shipment of ore in late November before suspending work for the winter. The shipment went to Salt Lake City where it will be run through the Utah Ore Sampler and sold to H. M. S. Milling Co.

MONTANA

● **Production of commercial phosphate** has been started by the newly-organized Williams Phosphate Co. from its extensive phosphate beds in the Upper Ruby area of Madison County, Mont. Manager Griff Williams reports that millions of tons of phosphate suitable for direct application to the soil if pulverized to 60 to 100 mesh has been developed since the property was taken over in July 1951. The mine is an underground operation and a 250-ton mill has been constructed at the portal of the main adit.

● **Minerals Engineering Co.,** Grand Junction, Colo., firm, has completed its new 300-ton tungsten mill at Glen in Beaverhead County, Mont., and the plant is already in operation on a three-shift basis handling ore from both the company's Lost Creek Mine and the Brown's Lake Mine, leased from American Alloy Metals. The properties are on opposite sides of Sugarloaf Mountain in Beaverhead County and both are being mined by open-pit methods.

The $300,000 mill was built in record time, having been started early in September.

Mill concentrates are being shipped to the Salt Lake City refining plant of Salt Lake Tungsten Co., which is jointly owned by Minerals Engineering and Sylvania Electric Products Inc.

MICHIGAN

● **Zontelli Brothers portable plant at Pabst C. mine in Ironwood** for the past four years has been handling the old, low-grade stock-piles which accumulated through the years from former underground mining. With the completion of the 1953 season, the plant has finished its work and most of the equipment has been sold to the North Range Mining Co.

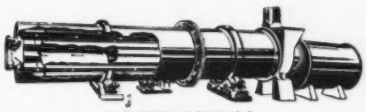
● **H. J. Richards,** general superintendent on the Menominee Range for Pickands, Mather & Co., states that the Fortune Lake Mine near Crystal Falls will complete its open pit mining in 1957. After that year operations will be continued underground. The Peter Kiewit & Sons Co. of Omaha, who have had the stripping contract at the mine, will continue stripping through the winter, six days a week. A total of 2.4-million cu yd of surface plus 1-million cu yd of lean ore and rock will be removed. During the next three years Pickands, Mather & Co. will carry on extensive exploration work so that plans and development work for the underground mine may be completed by 1957.

At the Lawrence mine, south of Crystal Falls, the old Carpenter mine shaft has been repaired to the 430 ft and 630 ft levels and development work is being pushed on both levels. A new headframe and surface buildings have been constructed. Richards estimates that the Lawrence mine will produce about 75,000 tons in 1954, 300,000 in 1955 and 430,000 tons annually after that. An approximate 52% recovery is expected from the crude ore.

MINNESOTA

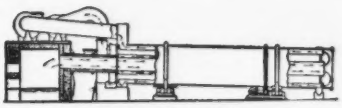
● **M. A. Hanna Co. has planned a winter stripping program** of 21-million cu yd for this winter at its Minnesota operations.

Stripping will be carried on at the Enterprise, Douglas, Weggum, South Agnew, Morton, Section 18, Carlz, Mesabi Chief, Perry-Wyman, Harrison, Patrick A, Patrick C and Buckeye on the Mesabi range. Cuyuna range mines included in the program

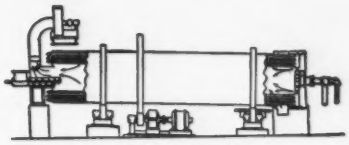


DOUBLE-SHELL SEMI-DIRECT HEAT DRYERS

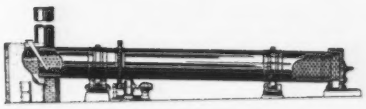
SINGLE-SHELL DIRECT-HEAT COUNTERFLOW DRYERS



DOUBLE-SHELL INDIRECT-HEAT DRYERS



STEAM-TUBE INDIRECT-HEAT DRYERS



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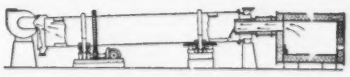

SINGLE-SHELL DIRECT HEAT PARALLEL-FLOW DRYERS

SINGLE-SHELL DIRECT HEAT HOT AIR DRYERS

ROTARY COOLERS

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Minnesota (*Continued*)

are the Alstead, Feigh, Huntington, Louise, Maroco, Portsmouth and Yawkey Reserve, a new mine.

Construction projects include moving the transformer station at the Douglas to permit additional stripping; raising the tailings pond dams at the Duncan and Douglas; a second stock-pile loading track at the South Agnew; a washing and screening plant, hoist house, loading pocket, loading track and yards at the Morton; a heavy-media and jig plant at the Carlz and modification of the heavy density and the cyclone plant.

● **Erie Mining Co.** has let a contract to Peter Kiewet & Sons Co. for harbor development at Two Islands. The harbor development is part of Erie's expansion plans for mining and processing taconite. Two Islands is near Schroeder, on the north shore of Lake Superior about 75 mi northeast of Duluth.

Harbor work was to begin in November with the start of construction of a 1,300 ft breakwater. Contract also has been let for some 3 mi of railroad grade approaching the harbor development.

This railroad grade eventually will be connected to a new railroad which will link the harbor with the taconite mining and concentrating district near Aurora, on the Mesabi, some 73 mi inland.

● **A Certificate of Achievement in Safety** has been awarded to the Enterprise mine at Virginia, operated by the M. A. Hanna Co. It was granted for having worked 122,802 man-hours in 1952 without a lost-time injury. E. C. Johnson is mine superintendent.

MONTANA

● **Shipments of lead-silver ore** are being made to the East Helena smelter of the A. S. & R. Co. by H. E. Longmaid and John Hopkins of Helena from the Cleveland mine, northwest of Boulder, Jefferson County, which has not been operated for many years.

● **A. H. Eiselein & Associates, Boulder,** recently shipped a car of uranium ore to the Vitro Chemical Co., at Salt Lake City. The ore came from the One Eagle mine near Clancy, Jefferson County, Montana.

NEVADA

● **Construction of a mill is under way,** and heavy machinery is being moved into the Silver Palace district in Nye County where Harry Howard, well known Fallon mining man, has launched a large scale development. Howard recently negotiated a contract for 15 patented mining claims in the area, with an option to buy. The owner is Ed Berryman, and the sale price is reported at $350,000 with 10% down payment. A report by engineers indicates 50 tons of tungsten, lead, silver and zinc ore can be mined daily for a period of five years without any further development.

● **Kilns at the Manganese Ore Co.** near Henderson will be fired up soon and the plant is expected to get back into production early in 1954. The company suffered a heavy fire loss last June when much of its plant was destroyed. Since then rebuilding has been under way, but work has been delayed due to labor disputes.

After the kilns are fired they will be slowly heated to avoid expansion cracks. Temperatures of 1,000 deg in the calciner and 2,100 deg in the nodulizing kiln are expected to be reached gradually.

F. A. McGonigle, general manager of the company, said the first step when operations are resumed will be to pump stored concentrates into the filtration plant, thence through the kilns. Shipping of processed nodules is expected to start ten days after the resumption of work. The firm has 18,000 tons of concentrates now

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stored, and believes that amount will be sufficient to supply the kilns for two months.

● **A promising gold ore vein** has been discovered by Mrs. Lorena Peterson in the Hot Creek range near Warm Springs in Nye County. Surface trenches have revealed parallel veins ranging from 1 to 10 in. in width. Pannings have shown the ore contains both silver and gold.

● **A major tungsten strike** has been made at the Linka mine near Austin, according to E. J. Frawley, president of Uranium Mines of America, Inc., which operates the property. Diamond drilling from the surface has cut across a 40-ft-wide ledge of tungsten ore at the 150-ft level, and a preliminary assay of ore from the mine has shown values of $40 per ton. Drifting is being pushed in two directions along the strike area, and about 50 tons of ore is being mined daily and stockpiled on the surface. Consulting engineer on the project is Roy A. Hardy, who is also in charge of operations at the big Getchell Mine in Humboldt County.

● **Officials of the Eureka Corp. report** having located a new orebody of excellent grade in the Adams Hill section of Lander County. The new ore, located by diamond drilling, lies a mile north of the Fad shaft workings, and at a depth of 900 ft, which is above the horizon where the Fad workings encountered extreme water problems. Preliminary estimates in the new section indicate a gross grade of around $100 per ton in lead-zinc, gold and silver over a thickness of 12 to 15 ft. The Eureka Corp. is controlled by Ventures Limited and Associates.

● **Four mines are now producing** ore and shipping their products to the Kaiser processing plant near Fallon. They are the Cirac Mine, two Keller properties, and a mine in Venice Canyon owned by C. J. Smith and R. L. Tiefel. All are producing fluorspar of good grade. At the Cirac mine Charles A. Joseph and James Lee are working from a stope 600 ft from the tunnel portal and the fluorspar vein is showing a width of more than 2 ft. They expect to have enough ore to keep them busy for two years. The Keller mines, one in Dixie Valley and the other in Iowa Canyon above Austin, are supplying 200 tons of fluorspar per month. The Kaiser Co. is also operating a mine in the Broken Hills district with good results. Known as the old Vet Baxter property, it has been producing steadily since the mill was started about a year ago.

NORTH CAROLINA

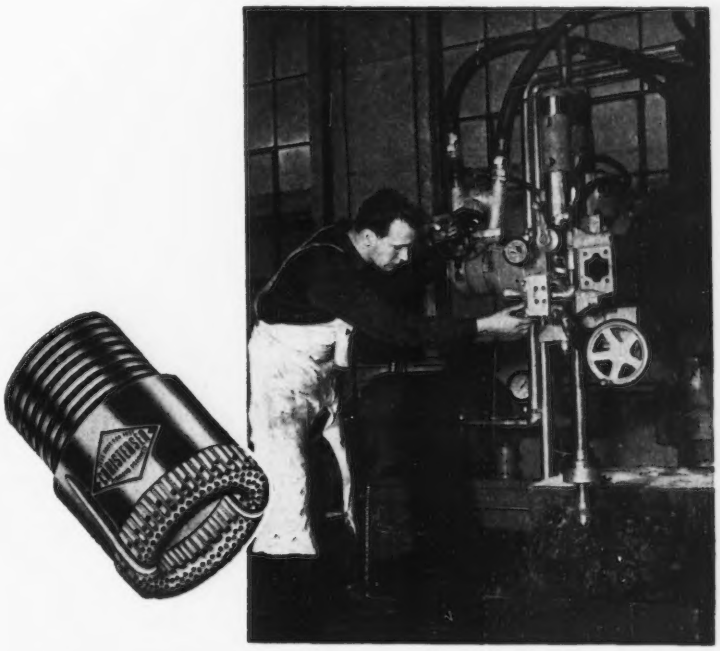
● **Tungsten Mining Corp.** of Vance County, filed suit in United States District Court at Raleigh, Dec. 3 seeking to collect $227,031.76 in damages from the United Mine Workers of America as a result of a strike called at the mine in January 1953, which the company contends was in violation of the National Labor Relations Act.

The company alleges that the UMW encouraged the strike although the United Stone and Allied Products Workers of America, CIO, has been certified as bargaining agent for the workers, and that this constitutes a violation of the NLRB regulations.

It asks $200,000 for curtailment of production during the strike, and an additional $27,031.76 which it said was necessary to cover the costs of guards to protect company property and other expenses caused by the work stoppage.

In its complaint, the company states that on April 3, 1946, the United Stone and Allied Products Workers was elected bargaining agent for the Tungsten employees and that the last agreement entered into by the company and the union was on Dec. 18, 1952, to replace an agreement expiring Jan. 15, 1953. The latter agreement currently is in force, it is stated, and extends until Jan. 15, 1955.

Despite this agreement, the complaint states, the UMW encouraged a strike on Jan. 9, 1953, which was attended by considerable violence and



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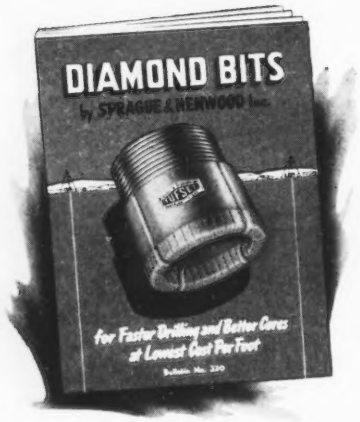

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North Carolina *(Continued)*

continued until Feb. 3, 1953, when a restraining order was issued against the UMW by U. S. District Judge Don S. Gillam.

The company states that because "production was curtailed subsequent to and during the strike, causing damages for failure to deliver to our customers," it entailed a loss of $200,000.

The company operates both a mine and processing plant.

OREGON

● **Exploration work** at the Babyfoot chromite mine during the past summer revealed two bodies of ore, 16 in. and 2 ft wide and separated by 16 in. of serpentine. The chromite stringers occur at the base of a small serpentinized ultrabasic sill and lie parallel to a footwall of argillite and metavolcanic rock striking N. 15 deg W. and dipping 68 deg E. The Oregon Department of Geology and Mineral industries reports samples assayed Cr_2O_3 45.90% Fe 10.89% in the 16 in. body and Cr_2O_3 52.30% Fe 10.44% in the 24 in. body. The mine, located in NW¼ Sec.30,T.38S.,R.9W., in Curry County at elevation 3600 ft, is owned by Chetco Mining Co., and under lease to R. Wilder, A. Wheeler, J. Wheeler, and D. Little, all of Selma, Ore.

● **The lower tunnel of the War Eagle** claim in Josephine County is being cleaned out and cinnabar is being mined and retorted for production of mercury as further exploration work goes on. The property is being worked by James H. Holtzclaw, Jesse A. Holtzclaw and S. A. Edwards. A retort consisting of three 1 ft x 8 ft tubes has been built. The ore occurs in a fault zone containing brecciated chalcedony and schist fragments cemented by marcasite. Cinnabar occurs in the matric of breccia and the clay gouge.

● **Copper concentrate** from 23 tons of ore of the Noonday-Thompson mine in Coos County has been shipped by Earle N. Young, 514 N.W. 2nd St., Grants Pass, to American Smelting and Refining Co., Tacoma, Wash. Ore was concentrated in the Homa mine mill and produced 6,350 pounds of concentrate for the shipment from the mine which Young plans to work next year.

● **Exploration of chrysotile asbestos** occurrence is being made on several Joseph County claims optioned by the Canadian Johns-Manville Company from George C. Foster, Kerby. Geologist John Gill is supervising the diamond drill test holes being bored under contract with Medford Drilling Company, Medford. The claims were originally part of a placer mine and Foster discovered the asbestos in a

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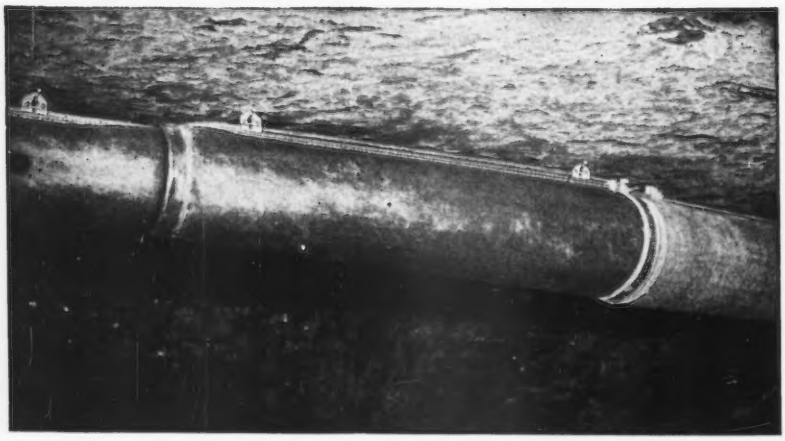

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Oregon *(Continued)*

tunnel dug along the contact of moderately indurated Quaternary gravels with underlying serpentine. A zone about 6 ft wide with various attitudes is exposed in the face of the 147-ft tunnel.

● **Enough chrome ore** is in sight at the Haggard and New mine in Grant County to keep the Dog Creek concentrating mill built this summer by Burt Hayes, operating next year. Hayes ran his fifth and last shipment of ore in the mill in late November and expects to have milled 200 tons before the season's stockpile.

● **The U. S. Bureau of Mines laboratory,** Albany, will make a test run of ferrochrome from 30 tons donated by Clint Haight, Jr., owner of the Chambers and Iron King mines in the John Day country of Grant County. The ore test was arranged after a John Day Chamber of Commerce meeting at which were representatives of the Bureau, the U. S. Geological Survey and the Oregon Department of Geology and Mineral Industries.

● **Incorporation of the John Day Mining Company** by F. A. Neuman and associates of John Day, Ore., has been completed and the company plans to try to operate the leased Dry Camp chromite property through the winter months. Neuman is mining from the upper pit. Ore in the lower pit was mined last summer on a sub-lease basis by Zanetti Bros., Wallace, Idaho. The ore is processed at the mill owned by the Tri-County Mining Co.

● **State Department of Geology** and Mineral Industries' publication, The Ore Bin, reports in early December that discovery of a new vein of copper and gold values was recently made on the hill above the old Standard workings on Dixie Creek in Grant County. Drifting is planned for the winter months if an access road now being rushed can be completed before severe winter. The road work began after a 17-ton test shipment of ore to smelter was made following initial assays.

● **Titanium bearing ore** scattered so freely over some Klamath Indian Reservation lands of southern Oregon that it can be picked up by magnet appears to have little chance of mining development. Interest in the ore, which occurs as titaniferous magnetite, came as a result of defense industrial needs and when E. J. Diel, Klamath reservation superintendent, asked the USGS to investigate. The Survey issued a paper after its investigations but prospects were not encouraging. The Klamath tribe has control over resources of its reservation and presumably would have leased tracts for mining.

F. W. Libbey, director of the Oregon Department of Geology and Mineral Industries, reported the ore bits respond to magnetic attraction in

some parts of the Kirk-Lenz district, but under the most favorable occurrences, observed the metal would cost about $4 a pound when processed.

● **The Sanger gold mine,** an early day mine in the eastern part of the State will soon resume production, according to a report from Baker. A gold bearing vein is said to have been opened for more than 300 ft by William Wendt and he has installed a small testing mill.

UTAH

● **Charles A. Steen, Moab,** president of Utex Exploration Co., testifying at a two-day November hearing of the Senate Minerals, Materials and Fuels Economic Subcommittee in Salt Lake City, said 2,125,000 tons of uranium ore reserves have been blocked out in San Juan County.

Steen coupled this estimate of reserves in the Big Indian Mining District, 39 mi. southeast of Moab, in what he called "the miracle square mile and-a-half", with an estimate that the area has a sustained production potential of 1,000 tons of uranium ore daily.

The recent finds include "a massive bed of uraninite and tyuyamunite ores, ranging in thickness from 10 to 40 ft which underlie the area," said Steen. Latest discovery includes a find of high grade ore some three miles north of Steen's original Mi Vida discovery mine.

Six operating companies and their present known reserves were listed by Steen as follows:

Utex Exploration Co. (12 claims) 1,300,000 tons of reserves.
Big Indian Mines, Inc. (Mamie claim) 525,000 tons reserves.
Christensen & Herron (two claims) 100,000 tons plus.
Big Buck Mines (11 claims) 100,000 tons plus.
Little Beaver Co. (two claims) 100,000 tons plus.
Cal Uranium Co. "Very large reserves."

"Strong geological evidence indicates the present reserve picture is far from the final picture and the reserves are expected to increase steadily until the Utex ore body is completely blocked out," Steen told the Senate subcommittee hearing.

● **Officials of the Vanadium Corporation of America** have reported "the largest pitchblende showing in place of any mine in the United States" at their Marysvale property. They cautioned, however, that mining costs in the Marysvale district are "exceptionally high." Company vice-president D. W. Viles, expressing belief the VCA Marysvale operation will be "one of the largest producers in the country," stated the VCA "has spent a huge sum developing the mine to its present stage."

The property includes the Pratt Seegmiller claims, the first uranium

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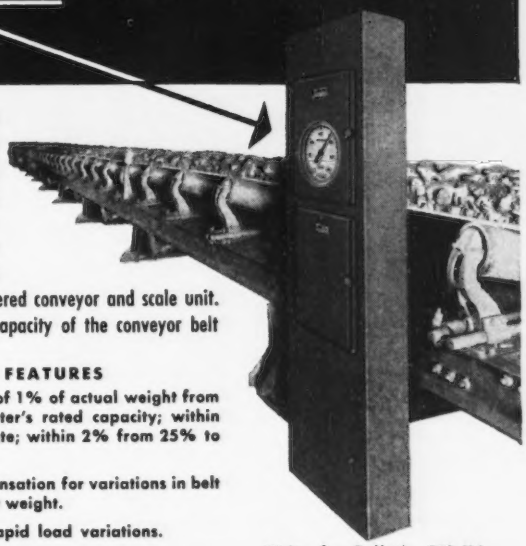

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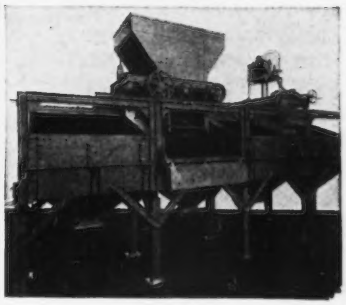

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Utah *(Continued)*

discovery claims in the Marysvale district. VCA has been developing the mine for four years, and is now working "some ore" at a vertical depth of 750 ft.

A three compartment shaft was recently completed, its bottom level connecting with a 2,000 ft crosscut. The crosscut is to be utilized for a main haulage tunnel.

● **Three uranium ore processing mills** are in the blueprint stage in Utah—but none has received a definite green light.

In the order in which mining men of the region think they will be built, these are a $1-million expansion at the AEC mill at Monticello; a $3-million VCA mill at Hite; and the proposed Utex (Charles Steen) mill to cost $3-million at Moab.

A spokesman for the Atomic Energy Commission's raw materials office has confirmed that a $1-million appropriation is being sought for expansion of the present Monticello mill.

The present Monticello mill, only one of nine in the nation owned outright by the AEC, is operated on contract by the Galigher Co. of Salt Lake City. It utilized a soda ash or caustic soda reduction process for changing uranium ore into uranium oxides. The AEC plans to replace the caustic ash reduction process with the conventional sulphuric acid leach method used at most Colorado plateau mills if the requisite appropriation is forthcoming.

Vanadium Corporation of America, which operates a pilot plant mill at Hite, has been negotiating with the AEC for construction of a $3-million uranium mill there. Much of the ore to be processed would come from the Happy Jack Mine in San Juan County. The VCA Hite pilot plant "has worked out a process we know will work in meeting specifications of the AEC" company officials stated.

● **A "major" uranium find** has been reported near Moab by the Oklahoma Exploration Co., Tom Hudson, president, on land close to the Steen Mi Vida properties of Utex Corp.

The claims are located at the foot of the west rim of Big Indian Wash, just east of Steen's northernmost property, the Mamie Claim. The discovery site is some 39 mi. southeast of Moab.

Mr. Hudson stated he had core drilled on four of 150 claims extending down Big Indian Wash toward Lisbon Valley, with test ores assaying up to 5% uranium oxide. Drills went to a 500 ft depth, it was added.

Hudson, a former oilman from Pawhuska, Okla., termed the find "potentially the richest uranium mine in the nation."

Superintendent Lewis Stilson of the U. S. Uranium Corp. has reported encountering a seven-foot vein of highgrade ore in the Thunderbird claim at Temple Mt., Emery County.

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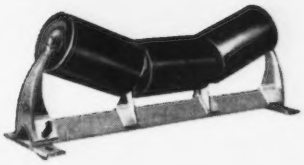
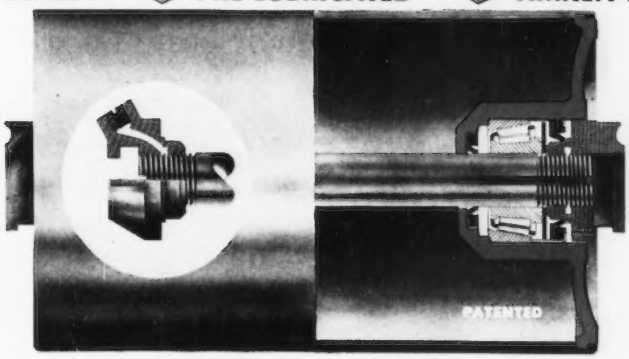


CGC UNIT-SEALED CGC PRE-LUBRICATED CGC TIMKEN BEARINGS



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WASHINGTON

● **A completely automatic plant for the production of high quality zinc oxide** is to be built at N. 115 Park, in Spokane, at an investment of nearly $200,000, according to Barnard Wilcox, a Wallace, Idaho, mining engineer who has invented a new process for low-cost production of zinc oxide after working on the development process in the Coeur d'Alenes for about four years. Northwest Chemical & Refining Co. has been organized by Mr. Wilcox and associates and the County Planning Commission granted the firm a permit in November. Zinc concentrates will be brought in from the Coeur d'Alenes and when in full operation about 50 tons of concentrates will be used daily with the production of from 32 to 35 tons of zinc oxide a day. Production of about 10,000 tons yearly is planned by the firm. Zinc concentrates are burned on a slag bed in a specially designed furnace at temperatures of 2,200 to 2,600 degrees Fahrenheit. Resultant gases which are swirled through baffles are passed through a flue with temperatures reduced to about 300 deg. Gases then go to a bag house where the zinc oxide is trapped in synthetic fiber bags. The bags are cleaned of oxide by a mechanical device.

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● **Chewelah Copper Co.** has announced plans to install a 200-ton mill on Eagle mountain near Chewelah.

E. P. Maher, vice president, said the firm hopes the mill will begin operation shortly after Jan. 1. The University of Idaho School of Mines is preparing flow charts, it was reported.

Maher estimated the company has more than 250,000 tons of copper ore on several holdings, including the old United Copper Properties, and leases on the Amazon claims and Copper King properties.

Chewelah, said Maher, spent several hundred thousand dollars in the past two years exploring and developing the sites. It has a $124,000 loan application before the DMEA.

The new mill will be located on the site of the old United Copper Co. mill that operated between 1910 and 1920.

Stockholders of the Chewelah company recently increased the directors from five to seven, and elected the following men to the board: John A. Peterson, Colville; J. W. Gilmore, and J. R. Wigen, Spokane; John Burch, Olympia; and E. P. Maher, Gordon LaVigne and Phillip Skok, all of Chewelah. LaVigne was elected president, Skok secretary-treasurer.

● **Four new trustees of the Northwest Mining Assn.** have been elected by mail ballots of the members, according to Frank N. Marr, president.

The four, who took office Jan. 1 for three-year terms, are: Kuno Doerr, manager of the East Helena, Mont., smelter of American Smelting & Refining Co.;

S. M. Strohecker, Seattle, district manager of explosives department, E. I. du Pont de Nemours Co.;

David E. Watson, Spokane, treasurer of Thomas Consolidated Mines, Inc.;

Elmer A. Johnston, Spokane, president of Silver Dollar Mining Co. Johnston, a Republican, was majority leader of the state House of Representatives at the 1953 Washington legislature.

● **U. S. Gypsum Co.'s lime plant at Evans,** 16 mi north of Colville, which was closed by a strike April 7, 1953, is being dismantled by the Alaska Junk Co., highest bidder at a recent salvage sale, according to a former accountant of the company, Jack Bennett, who is conducting the final business. The company had employed from 40 to 50 at its plant and quarry, and had a payroll and wood bill of about $500,000 a year. After efforts to settle the strike had failed, the company announced in July that it would close operations, stating that the plant had operated on a narrow margin of profit for several years. The office building, three smaller buildings and the site will be retained by the company for the present, it was reported.

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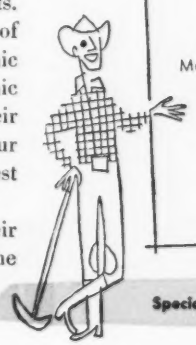

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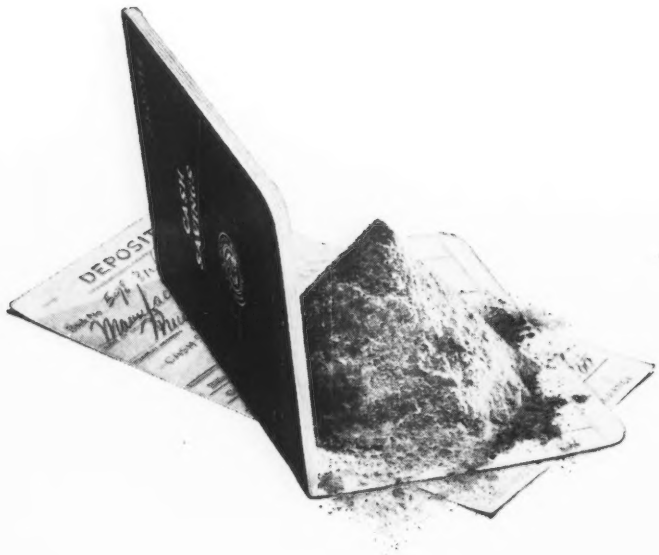

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Washington *(Continued)*

● **Tungsten Mining & Milling Co.** has leased its Germania mine, near Fruitland, to Penticton Tungsten Mines, Ltd., a British Columbia company, which also has an option to purchase the property. The property in Stevens County is leased for 10 years at a royalty of 15% on net proceeds from sale of concentrates, according to Paul H. Casey, president of the Tungsten company. The lessee is to mine enough ore in the next three years to pay annual royalties of $25,000 or make cash payments. The property may be purchased by the Canadian firm at any time within the 10 years for $125,000. Foreclosure proceedings have been recommended by the RFC unless something was done by Nov. 30, according to a letter to stockholders. It was pointed out that directors could still cancel the lease and option with the Canadian company if Tungsten stockholders could offer a better solution by Dec. 16. The $125,000, it was pointed out, would not pay all company debts and would leave nothing for stockholders because of the company's liabilities totaling $230,940.

● **Howe Sound Company,** operating the Holden mine near Lake Chelan, paid a quarterly dividend of 10c a share to its stockholders on Dec. 10. The company paid 35c a share the first quarter, and 10c a share the next two quarters, so the final payment of 10c boosts the total for the year to 65c per share, compared with $1.32 for 1952.

● **American Smelting & Refining Co.** which operates in Stevens County and has a smelter in Tacoma reported net income for the nine months ending Sept. 30, to be $11,690,248, compared with $23,486,201 in the same period of 1952, or $1.67 a share, compared with $3.83 a share in the comparable period of 1952. The company's statement covered results of its own operations and those of Federal Mining & Smelting Co., a subsidiary which merged with the AS&R last April. Net income was reduced by approximately $1,300,000 through a write-down of the company's zinc inventory to market value as of Sept. 30, 1953.

● **Applications may now be made** for the $100 A. E. Drucker scholarship, at Washington State College, J. D. Spielman, dean of the School of Mines, has announced. This yearly gift of the late A. E. Drucker, former dean, is open to all mining students and selection will depend on scholarship, character and need.

Dean Spielman also announced that the 64-page bulletin, "Small Scale Placer Mining," (written by Donald L. Masson, chairman of the mining department) and issued by Washington State Institute of Technology, will have a second edition which shows individuals are still interested in seeking the precious metals. It

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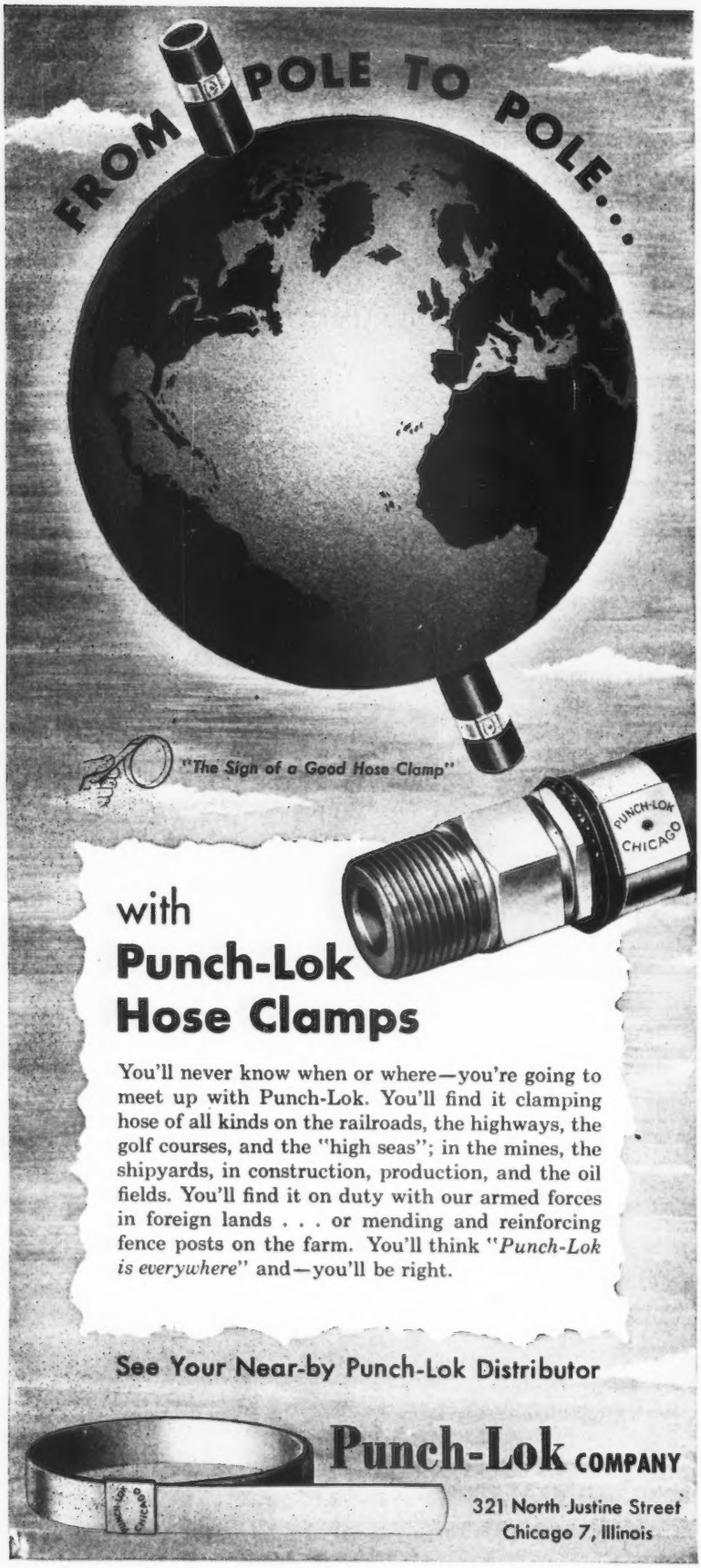
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Washington *(Continued)*

gives many tips for the search in this area and has topographical maps locating all known placer deposits in Washington and Oregon.

● **A giant 300,000-lb aluminum stretcher** was recently put into operation at Kaiser's Trentwood rolling mill. It is reported to be the world's largest with a pulling strength of 5-million pounds, making available stretched plate of a size never available before. The maximum size handled is 40 ft long by 2 in. thick. Another new machine for producing better aluminum steel tubing has also been put into operation. A flat strip of aluminum alloy is passed through nine sets of rolls each assisting in forming a circular tube. The tube then goes through a high frequency coil where induction heat and pressure make a welded seam. The mill was developed by the Yoder Co., Cleveland, Ohio.

David Mayers, works manager at the Kaiser Trentwood rolling mill, reported in mid-November that an estimated 215 workers had been rehired of the 600 who were laid off in late October and early November. He attributed this to a somewhat improved market and said employment was about 15% higher in November than it had been at the same time in 1952.

● **GSA announced Dec. 1,** that it will buy 18.7-million lb of copper refined from Holden mine ore of Howe Sound Co., and will pay 31½¢ per pound f.o.b. carrier's conveyance at any point within Washington, Oregon, California or Nevada, at Government option. Howe Sound is to produce 9,020,000 lb at the Chelan County property by Dec. 31, 1954, and 9,680,000 lb in 1955. The agreement may end earlier than Dec. 31, 1955, if the full output has been achieved. John J. Curzon of the Howe Sound Co. said that production would not be stepped up now because of the order. Fifteen hundred tons are being mined and milled daily at the property.

● **Directors of Tungsten Mining & Milling Co.** of Spokane have accepted an offer of Penticton Tungsten Mines, Ltd., for a lease and purchase option on the Germania Mine near Fruitland.

Paul H. Casey, president of the Spokane firm, revealed the agreement in a letter to stockholders. The Canadian company will have a lease to occupy the Stevens county property for 10 years, at a royalty of 15% on the net proceeds from the sale of concentrates. In the next three years, Penticton Tungsten is to mine enough ore to make royalty payments of $25,000 annually or pay in cash.

Penticton Tungsten then has an option to buy the property at any time within 10 years for $125,000. Of this, $25,000 would be distributed among the owners and the remainder applied on an RFC loan and debts.

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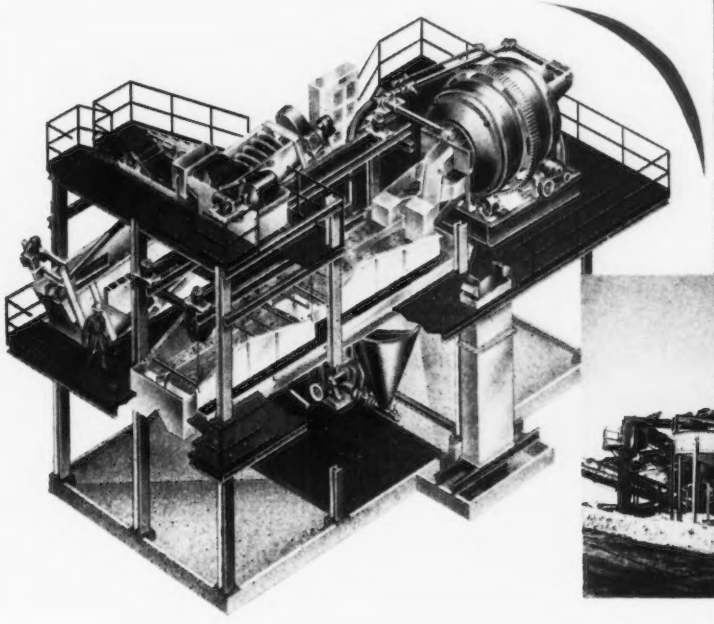

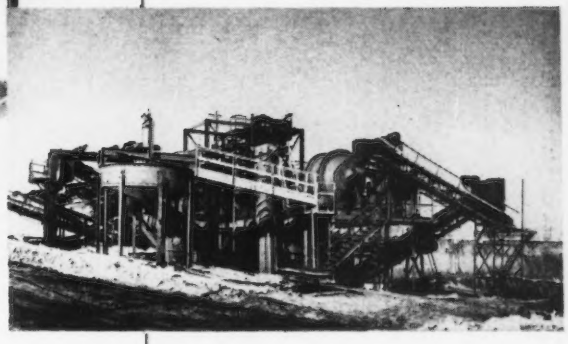

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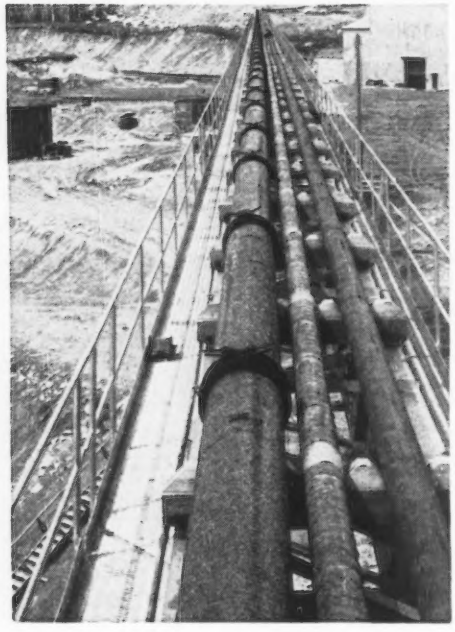
INDUSTRY NEWS IN BRIEF . . .

EFFICIENCY OF WOOD STAVE PIPE FOR MINING WASTE DISPOSAL OBSERVED IN SANTA FE INSTALLATIONS



MOUNTAIN IRON, MINNESOTA... 8500 lineal feet of machine banded, wood stave pipe was supplied by the Santa Fe Tank & Tower Company, Los Angeles, for disposal of *mine tailings* in the Mountain Iron region. This pipe line has an inside diameter of 8 inches, and carries the tailings a considerable distance to a disposal area. Actually, wood stave pipe is made to measure from 2 *inches* to 20 *feet* in diameter. Such installations are being extensively used at mining operations throughout the world for carrying water, chemical solutions, etc.

The popular use of wood stave pipe in mining installations has a number of very definite advantages, according to Santa Fe engineers. Aside from its natural *economy,* wood pipe is not affected by corrosion. Its large *flow* capacity does not decrease with age, nor is it affected by electrolysis. Wood stave pipe neither expands nor contracts in varying high and low temperatures, and therefore does not require costly expansion joints necessary with other types of pipe.

Wood stave pipe has proven to be most efficient for *tailings disposal,* particularly, because it offers a *hard* wearing surface to abrasive materials. It's easy to install and requires little maintenance.

Santa Fe plant facilities and inventory are among the largest for this specialized type of wood pipe construction. Branch offices are maintained in all principal cities. For complete information and engineering data on Wood Pipe, Cooling Towers, Cylindrical Gas Scrubbers, and other industrial wood specialties, write Santa Fe Tank & Tower Company, 5401 S. Boyle Ave., Los Angeles 58, Calif.

IN CANADA

BRITISH COLUMBIA

● **Aluminum Company of Canada** giant Kitimat project is slated to begin producing aluminum ingots this spring or early summer.

● **Plans for the big Ventures-Frobisher-Quebec Metallurgical** hydro-smelter-mining project in northern B. C.-Yukon area are going ahead at an accelerated rate, according to company officials. Details for next season's survey work were mapped by officials of the three companies at a meeting recently in Ottawa held to discuss prospects for the eventual 5-million hp project. Detailed plans are to be drawn for an initial 25-30,000 hp hydro installation on a site located near Taku River by survey parties this summer. It is hoped to start construction next spring.

ONTARIO

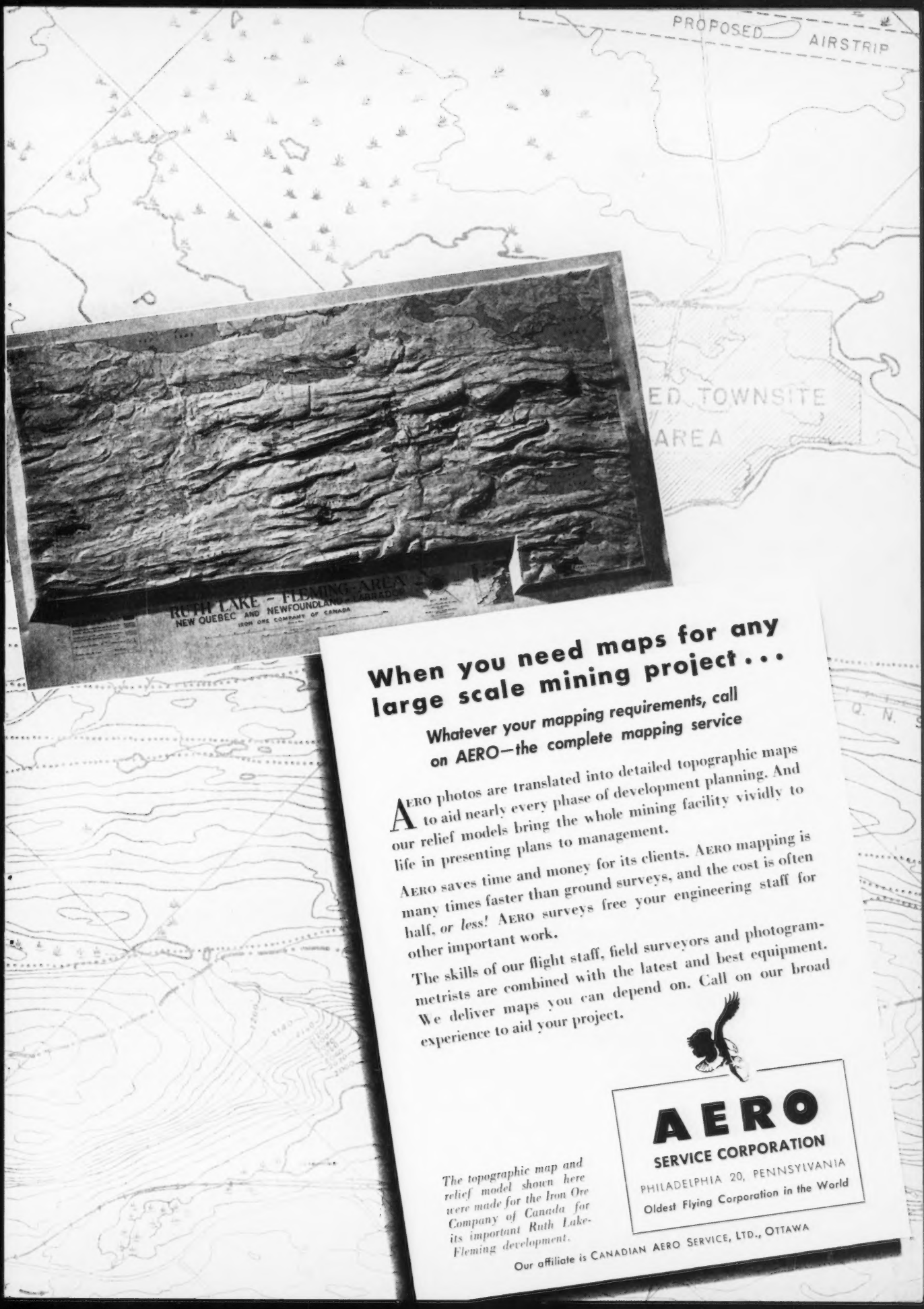
● **Canada's newest nickel-copper mill has started operations.** East Rim Nickel Mines having commenced ore treatment in its 500-ton plant on the east flank of the Sudbury Basin, with concentrates shipped under contract to the Falconbridge smelter. Milling rate for the time being is held to 350 tons daily, but increase to 500 tons is expected early in 1954. The crushing plant is designed for 1,000-ton treatment.

Latest ore estimate, some months back, showed 1,393,040 tons averaging 1.38% nickel and 0.48% copper. Prior to mill completion the company shipped 38,464 tons of development ore with grade averaging 1.58% nickel and 0.59% copper.

● **Latest company to start prospect drilling in the Sudbury district** is Bunker Hill Extension Mines, the property being an optioned eight claims near the Worthington mine in Drury Twp., west of Sudbury. The prospect is an old one that has been idle for some years, with encouraging values reported from limited underground work done in the early days from an adit.

● **Busiest exploration area in Ontario this season** has been along the north shore of Lake Huron where a 100-mi stretch of country has seen claim stakings by the thousands. Chief activity has been in the section north of Blind River, but the staking has spread over many townships. The area may become an important uranium source.

Geology of the area differs from that of other Canadian uranium areas, the values being found in sedimentary beds of quartz conglomerates, a series of flat-dipping structures that have been traced for great distances. Most



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The topographic map and relief model shown here were made for the Iron Ore Company of Canada for its important Ruth Lake-Fleming development.

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BRANCH OFFICES AND WAREHOUSES THROUGHOUT NORTH AMERICA

Ontario *(Continued)*

promising showings located to date are those of Algom Uranium Mines and Pronto Uranium Mines, both within a few miles of Blind River. Pronto, the original discovery, has so far been shown by drilling to have 1.9-million tons averaging 0.14% U_3O_8 to a depth of 200 ft.

On the Algom property no tonnage estimate has been issued, but the main band tested shows a length of 2,200 ft averaging 0.113% U_3O_8 across an average width of 10.8 ft. Neither deposit has been fully outlined.

A large number of companies are active in the area. While prospecting and drilling have been slowed down by the close of the open season, a large number of operators will continue work throughout the winter.

QUEBEC

● **Barnat Mines, growing gold producer of the Malartic area,** has secured indications of what might prove to be two new orebodies. On the 525-ft level flat drilling to the south from the north zone has encountered a section in diorite that averaged $6.34 per ton across 66 ft. Best section was on the footwall side, where 35 ft averaged $10.67.

The second showing, also disclosed by flat drilling, was found on the 1250-ft level and is north of the north zone and west of the main ore area. Discovery hole showed 27 ft averaging $11.72 per ton with another section of 28.5 ft averaging $5.80.

Although production is well protected by more than adequate developed and indicated ore on the mine's present levels, Barnat keeps looking ahead. As part of this policy a start is being made on shaft deepening to permit establishment of six new levels below the present bottom level at 1,250 ft.

● **Milling rate of Weedon Pyrite & Copper Corp.** has been upped to a daily average of 275 tons and the company's picture has been brightened by the signing of a five-year contract for pyrite. Up to this time practically all pyrite output (about 100 tons daily) has been stockpiled. Copper sales have been adequate to provide a modest operating profit, so the pyrite contract will make it possible to build up cash position quickly.

With profitable operations established the company is now planning an exploration program and will deepen its shaft to open another two levels.

● **Bellechasse Mining Corp. reports** that prospecting during the past season disclosed three iron showings on its 82-claim property in the Mount Wright area, 180 mi north of Seven Islands on the north shore of the St. Lawrence River.

Correct Eastern Standard Time is June 21st 1630 B.C.

From before the dawn of recorded history, man has tried to penetrate the mysteries of time and to measure its flight. At Stonehenge, on Salisbury Plain, England, sun-worshipping Druids set up, 35 centuries ago, what may have been a colossal shadow clock which marked, at least, the semi-annual swing of the sun. When the priest at the altar stone saw the sun rise directly behind the Hele Stone, he knew that the day was June 21st, or, rather, he knew that on this day the sun would cease to swing northward and would, on the morrow, start its retreat to the south. Other stones similarly marked the winter solstice, six months later. This solidly built timepiece is still running just as accurately as it did in the Bronze Age, but its six-month divisions of time are somewhat too broad for today's requirements, when time is so valuable. In the drilling business, Truco Diamond Bits have proved to be great time-savers. Their irresistible cutting power takes them through any formation swiftly, accurately, thriftily, dependably. They are used profitably in every phase of drilling. Have you our Diamond Bit Catalog?

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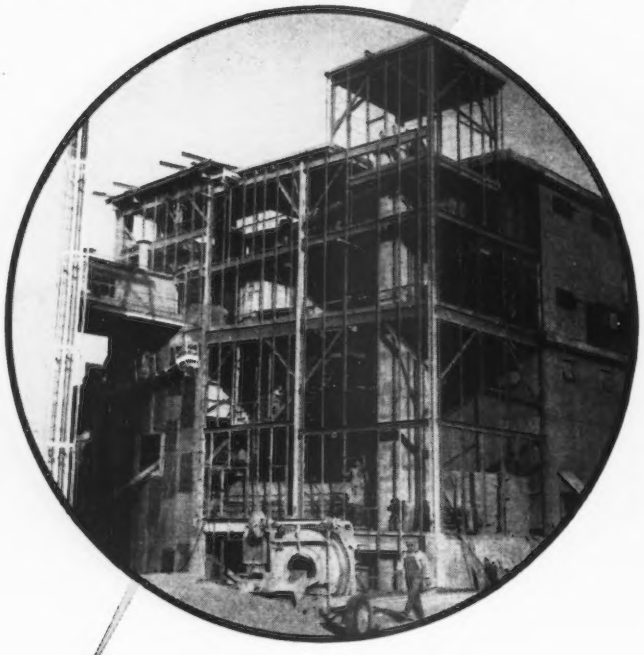

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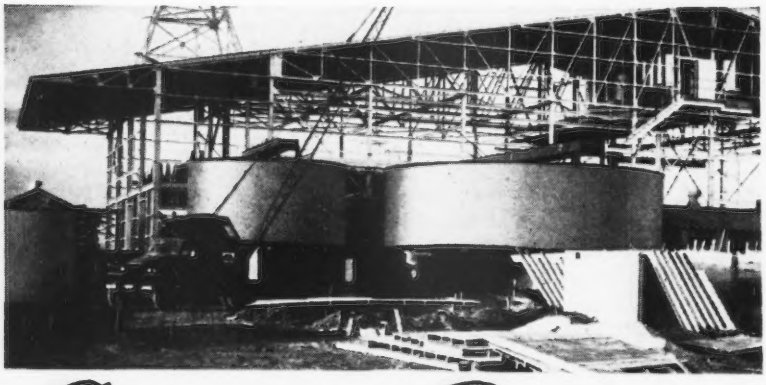


Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO

NEW BRUNSWICK

● **Surface drilling on the property of New Larder "U" Island Mines** in the Bathhurst area continues to enlarge the big base metal orebody. Hole No. 65, described as the best pulled on the property so far (and also one of the deepest) showed a true width of 150 ft averaging 7.94% zinc, 2.88% lead, and 2.97 oz. of silver for a gross value of $25.80 per ton. Best section was 60 ft averaging 16.79% zinc, 7.02% lead, and 7.39 oz. of silver. Average depth of the intersection was about the 750-ft horizon.

● **Harricana Gold Mine Inc. has changed its name** to New Harricana Mines with an exchange of shares on a basis of one new for four old. The change was made to permit new financing with which to explore the 46 claims owned by the company in the Bathhurst area about 1½ mi northwest of Brunswick Mining & Smelting Corp. First exploration steps have already been taken in the form of a geophysical survey, and diamond drilling is planned to probe the indications secured.

SASKATCHEWAN

● **Hudson Bay Mining & Smelting Co. Ltd.,** an important zinc-copper producer with properties at Flin Flon, Manitoba, announced that it has partially developed a new high-grade copper mine. The new property, so far a small operation, is in Saskatchewan, about 13 mi southwest of Flin Flon, it was reported.

Mine consists of two parallel orebodies separated by some 200 ft of lower grade. North orebody as adjudged to date is host to 70,000 tons of 10% copper ore to a depth of 400 ft. South orebody as estimated thus far to contain 180,000 tons of 4%, also to 400 ft.

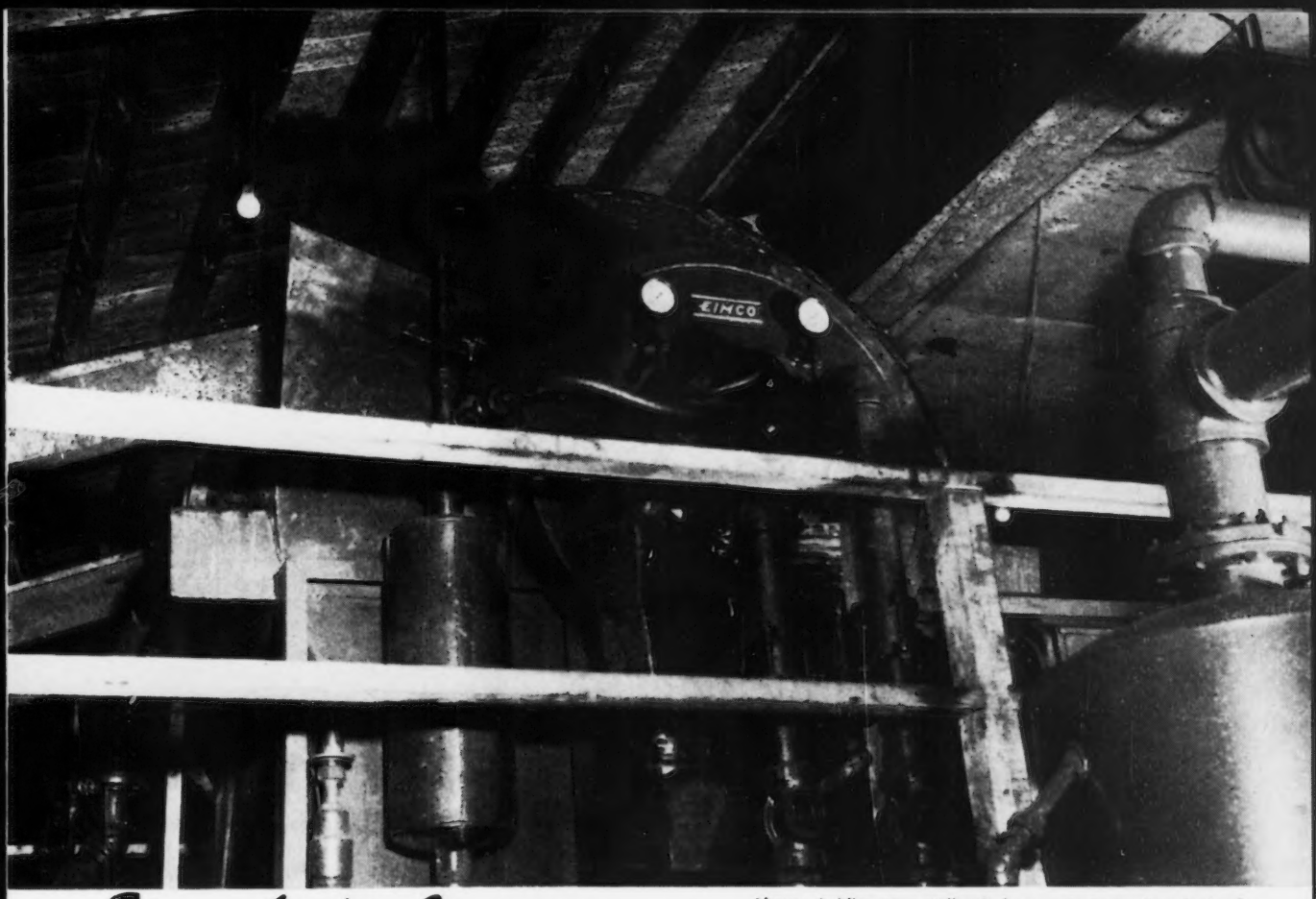
Hudson said that drilling has not as yet pierced below 400 ft. The mining company added that both orebodies boast about $2.50 of gold a ton.

● **Paymaster Consolidated Mines Ltd.,** considered by many to harbor the potentiality of becoming one of the richest gold mines in the Timmins district, planned to shut down Dec. 17.

The company announced that its decision was due to heavy operating losses and "to other circumstances beyond its control." One of "the other circumstances" was said to be labor trouble.

Mining men believe that rich ore underlies present workings but point out that it would take two or more years to reach it.

● **Frobisher Ltd. has paid** another $35,000 to Beaver Lodge Uranium Mines Ltd. under an option agreement, bringing its total investment to $128,-



Above: Agidisc on metallurgical concentrate in New England.

Eimco Agidisc Increases Metallurgical Filtration Efficiency

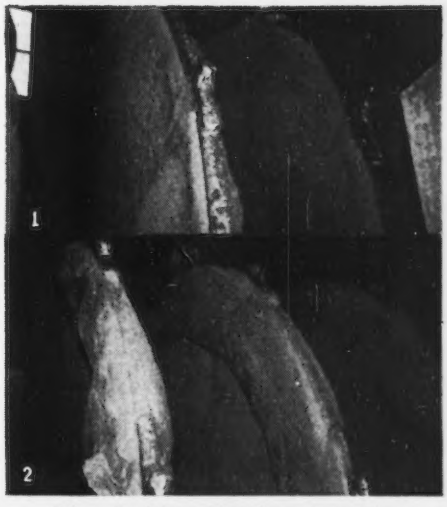
Eimco Agidisc Filters are increasing the production per square foot of filter area in metallurigcal plants.

The Agidisc keeps a fast settling slurry in solution so gently that no eddies are created to disturb the cake formation on the disc. The result of this gentle agitation is a thick even cake over the entire surface of the sector with a resultant uniform drying of the cake, free discharge from the cloth and longer bag life.

Agidisc filters will enable you to realize greater production per square foot of filter area over standard disc design if your slurry contains fast settling particles that settle in the tank. The test of this will be in observation of the operation of your filter. If you see a classification ring as shown in Fig. 2 at right, you are paying the penalty of poor production, high moisture in cake and short bag life.

Eimco has more experience in the design and construction of disc type filters than any other manufacturer. Let us help you with your metallurgical filtration problem.

1. An agidisc filter working on the same feed copper concentrate feed line at the same time as the standard disc. (2) Note classification ring on standard disc. Agidisc delivers 20% more cake with 2% less moisture.



Below: Coal fines filtered on Eimco fitler—note smooth even cake over sectors.

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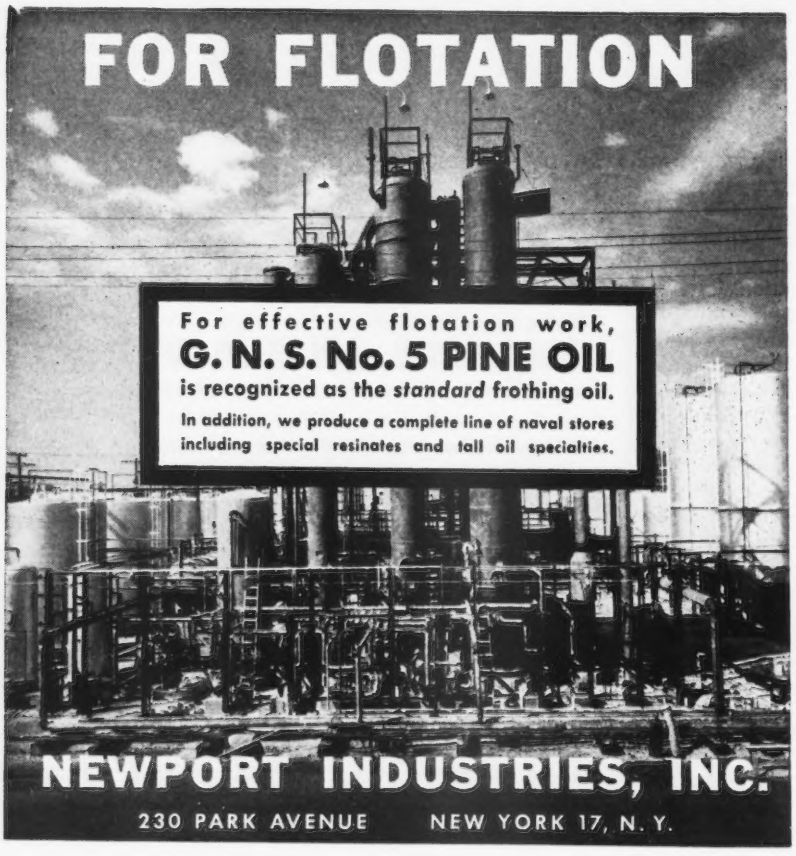
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Saskatchewan *(Continued)*

750, and will continue to direct the Vancouver firm's exploration and development program on uranium claims in northern Saskatchewan. Exploration will be speeded because of encouraging showings on the Bar 1-4 claims, where two drilling rigs have been operating.

ALBERTA

● **Nickel refining plant of Sherritt Gordon Mines Ltd.,** at Fort Saskatchewan, near Edmonton, is expected to go into operation the first of April, the company reports. Treatment of concentrates will start then, with output of nickel a month later. Natural gas has been turned on at the plant and a 144-mi rail line completed from Sherridon, Manitoba, to Lynn Lake, permitting shipment of ore from the Sherritt Gordon mine.

YUKON

● **Yukon Cassiar Asbestos Corp.** has spent several million dollars, it is reported from Whitehorse, in construction and development work and now production of chrysotile asbestos from the rich deposit in the McDame Creek area is being increased because of improvement of roads due to Government aid. About 300 men are employed at the property. Milling which started in 1952 has now reached daily capacity of 170 tons in an 8-hr. shift with the yield ranging from 10 to 12 tons of exportable fiber valued between $200 and $450 per ton. It is possible to recover a lower grade fiber but high transportation cost make it unprofitable for marketing. Plans are to increase capacity to 1,000 tons a day.

IN AFRICA

● **American Potash & Chemical Corp.,** Los Angeles, long a leading producer of lithium products, has broadened its activities in this field with the offering of lithium ores from a new source in Africa, President Peter Colefax announced.

Company has completed arrangements to handle lepidolite and petalite ore mined from a large deposit of high grade lithium-bearing minerals near Fort Victoria, Southern Rhodesia. Property is owned and will be operated by Bikita Minerals (Private) Ltd., under the management of Selection Trust, Ltd., a London mining concern with world-wide interests. American Potash & Chemical Corp. and The American Metal Co., Ltd., are associated with Selection Trust, Ltd., in developing the project.

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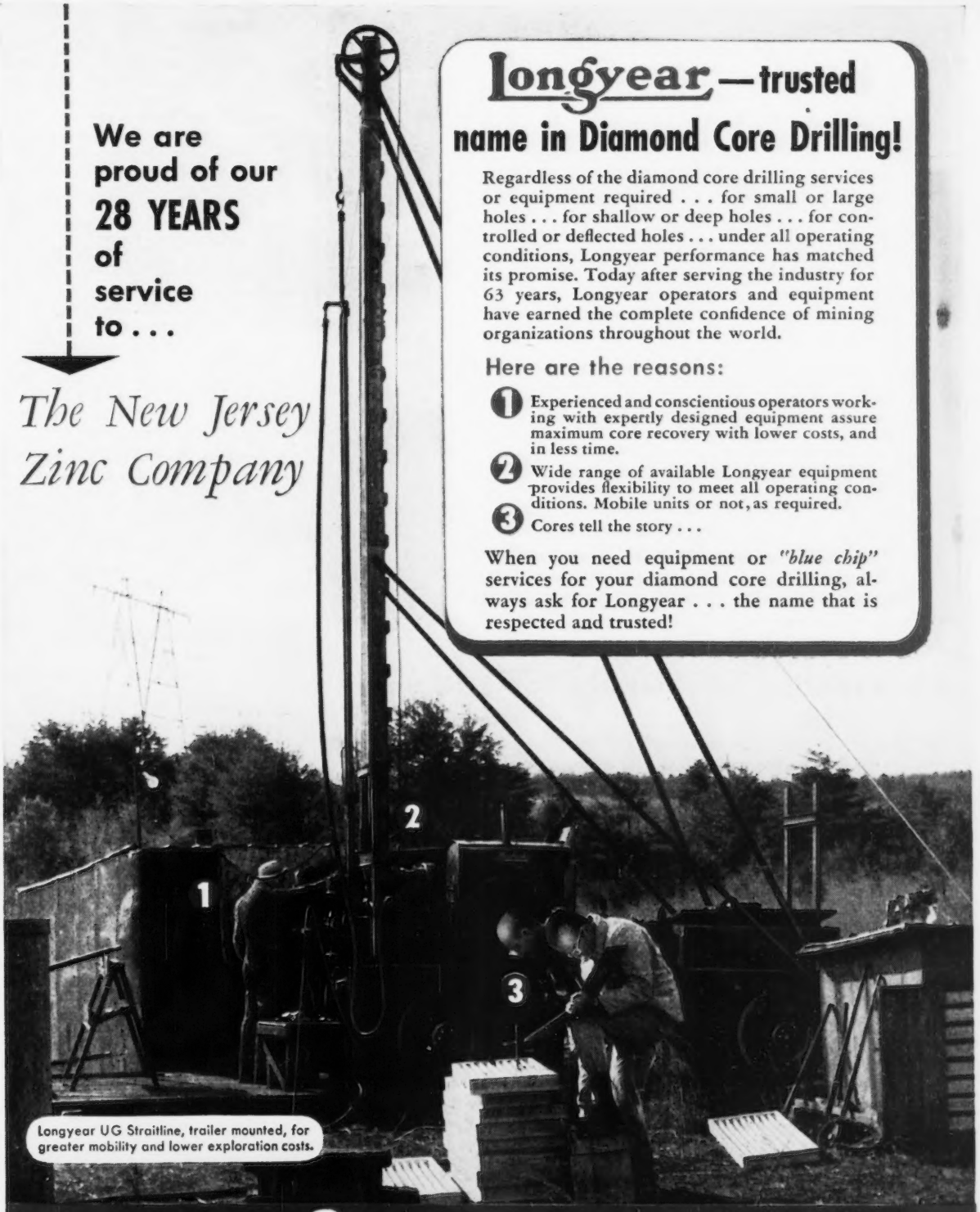

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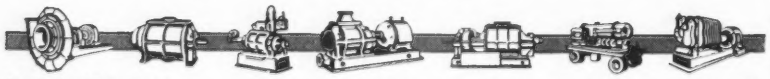

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Africa *(Continued)*

Lepidolite and petalite, Colefax explained, are used primarily by manufacturers of specialty glass and ceramics, but have many other industrial applications. Demand for lithium products has been increasing sharply, and they have been in short supply for some time.

American Potash & Chemical Corp. has been producing lithium products for many years from the brine of Searles Lake at its plant in Trona, California. Since 1951, in connection with its program of expansion in the field of fine chemicals, the company has been upgrading crude lithium concentrates to lithium carbonate.

Colefax said that the addition of the African lithium ores to the products handled by the company was another step in diversifying its activities in the chemical industry.

● **Dominion Reefs (Klerksdorp) mine** is planning to erect a £2-million plant for extraction of uranium from slimes. The plant, to be financed with British and American capital, is expected to begin operation in 1955.

● **South Africa's fourth** and largest uranium plant has been officially opened at the Western Reefs mine near Orkney, western Transvaal, by the Union's Minister of Mines, Dr. Albertus van Rhijn.

With the expansion of certain plants and the admission of other mines to the program, the capital cost of the uranium program was now about £50-millions and the estimated annual gross revenue was expected to exceed £30-million, Dr. van Rhijn said. Twenty-three gold mines had been admitted to the program.

● **Further expansion of uranium production** in South Africa is being undertaken. Randfontein Estates, the gold mine with the largest milling capacity, has a recovery plant under construction scheduled to start operating next year. It is announced that an expansion plan is to be undertaken immediately to increase the capacity appreciably.

In Northern Rhodesia active exploratory work is being undertaken with a pilot plant at Nkana to find a satisfactory flotation process to handle the uranium content of the Mindola Mine at Nkana.

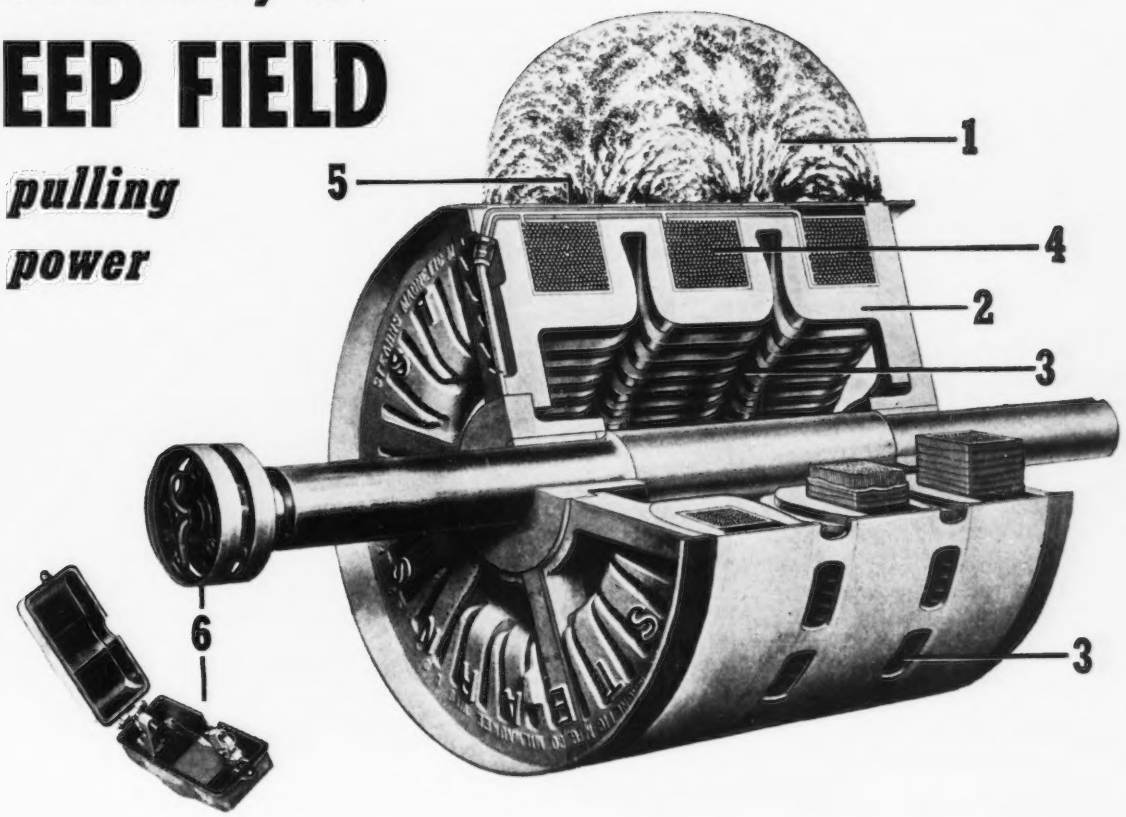
● **Amalgamated Tin Mines of Nigeria** reportedly plans a sharp expansion of columbite output. In October, this firm produced 68½ tons of the tin. A subsidiary, Keffi Tin Co., produced 37 tons.

● **Planned extensions** to the Rsuetnburg platinum mine bringing it to a capacity of 100,000 tons a month have been completed. Good progress has been made with the erection of the matte treatment plant which will allow the refining to take place in South Africa instead of in London as at present and it should be operating by the middle of next year.

Inside story of

DEEP FIELD

pulling power



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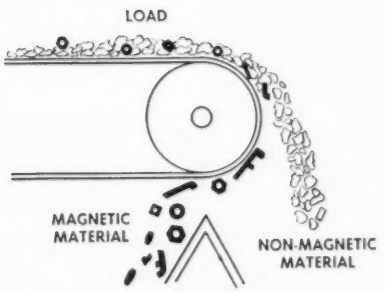

Diagram showing how Stearns magnetic pulley removes tramp iron.

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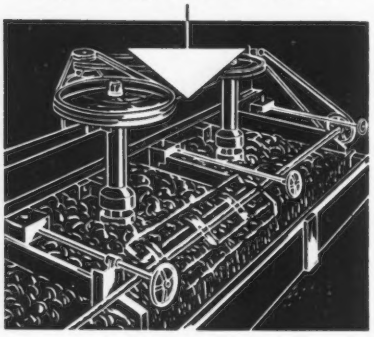

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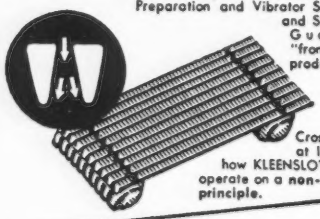

Cross section at left shows how KLEENSLOT Screens operate on a non-clogging principle.

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IN LATIN AMERICA

CHILE

● **Policy of giving the dollar a fixed rate of exchange** of 110 pesos while permitting the law of supply and demand fix the rate for the other currencies, has brought about the situation that the dollar, the most stable and sought for currency in the world, has in Chile a lower value than the so-called Belgian "dollar", which is quoted at 170 pesos; the Danish at 165 and the German at 145.

For this reason, copper from the smaller producers is now being sold in other countries instead of in the United States at lower quotations in cents per pound which yet bring in more pesos in Chile. To equalize this differential in exchange, copper would have to bring 46.4¢ in New York to balance the same number of pesos when the copper was sold at 30¢ in Belgium.

● **Compañía Minera Tamaya** has been trucking about 10,000 tons per month of 1.65% copper ore 35 mi to its mill at Punitaqui, where a 25% copper concentrate is made by flotation.

Ore is ground in 8 ft x 36 in. Hardinge mills and floated in Fagergren and Forrester machines. Monthly production amounts to 450 metric tons of concentrate. Costs are high due to the long freight and add up to $5.10 per ton of ore before general expenses which works out at $107 per ton of concentrate taking the official rate of exchange of 110 pesos to the dollar.

MEXICO

● **Texas International Sulphur Co.** will erect a plant for extraction of crude sulphur, using the autoclave process, near San Felipe, Baja California, to process sulphur from its Navarro concessions and newly acquired mining rights on adjoining concessions, President Victor Dykes announced in Houston.

Design of the plant is under the direction of J. Harry Pollard of Houston, consulting engineer for the company, who will also supervise the plant's construction and operation.

Sulphur deposits have been known to exist in the San Felipe area, 125 mi. south of the border, for approximately 40 years, but heretofore no practical processing and marketing facilities have been established. New transportation facilities, together with the new processing plant, have now made the deposits of commercial value.

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- Data on CMP (Combination Multiclone-Precipitator) Units.

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Latest data from Western Precipitation on Cottrell Recovery Equipment

Do you have operations in your plant where gas-laden suspensions, wet or dry, are a problem? Such suspensions may be dropping on surrounding property, causing nuisance difficulties. Or perhaps important values are being lost in stack gases that can be profitably recovered. Whatever the nature of your recovery requirements, you will find this 40-page Cottrell booklet of great help. It contains up-to-date data on the latest advancements in the electrical precipitation field – prepared by the organization that pioneered the commercial application of Cottrell Electrical Precipitators almost a half century ago and has consistently led in new Cottrell developments.

A copy of this data-packed booklet will be sent free to engineers and other executives interested in recovery processes. Send your request to our nearest office.

For nearly 50 years Western Precipitation has carried on a continuous research and development program on Cottrell Electrical Precipitators, Multiclone Mechanical Collectors and other types of recovery equipment. We are not affiliated with any other company in the electrical precipitation field except our wholly owned subsidiaries, International Precipitation Corporation and the Precipitation Company of Canada, Ltd. We are equipped to serve you anywhere in the United States, Canada, and throughout the world!

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WRITE FOR CATALOG

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Mexico *(Continued)*

Texas International Sulphur Co. in both engineering and geological studies before the decision was made to erect the plant. Dr. Eugene Callaghan, director of the New Mexico Mining and Technical Institute, made the most complete geological survey ever undertaken in the area.

"Our company estimates that it can produce commercial grade crude sulphur at San Felipe and sell it profitably in northern Mexico and in the world export market," Dykes said. "Our price should be easily competitive with Gulf Coast sulphur plus freight in the West Coast area."

Pollard notes ore bodies are of considerable size and that numerous pits and cuts have already been opened up and that further exploration will continue. Pockets of high sulphur content occur frequently in the ore bodies in these surface deposits, which show themselves in an area of several miles, he said.

ARGENTINA

● **It is expected** that National Lead Co. will start production of lead concentrates in its mine of Castaño Viejo this year.

Machinery for the 200 ton concentrator will arrive to the mine early in this year. Concentrates will be trucked through a new road built in part by the company, to Talacasto, nearest railway station, where storing and loading facilities will be erected. From there, concentrates will be shipped across the northern part of the country to National Lead smelter at Puerto Villelas on the Paraná river.

● **By a new cooperation plan** Dirección Nacional de Mineria and University of Cuyo are conducting several mining and geological surveys in the Province of San Juan. The sulphates deposits of Calingasta and the tungsten mines of Arrequintin have been thoroughly investigated.

● **It has been announced** that Comision Nacional de la Energía Atómica will erect a concentrator for uranium ores near Malargüe in Mendoza.

COLOMBIA

● **Cobre Ltda.**, an enterprise owned by the Spanish engineer Pedro Ferran Puig, announces that they are going into the production of high grade copper sulphate. The mines have a volume of 518-million cu m (677.5-million cu yd) of mineral. The melting oven has a capacity of three metric tons of mineral per day and the product has 98.2% purity. The output of the factory will be sufficient to attend the requirements of the country. The mines are located near California in the Santander Department.

(Continued on page 162)

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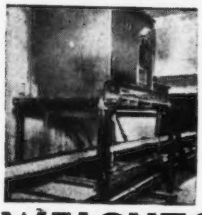

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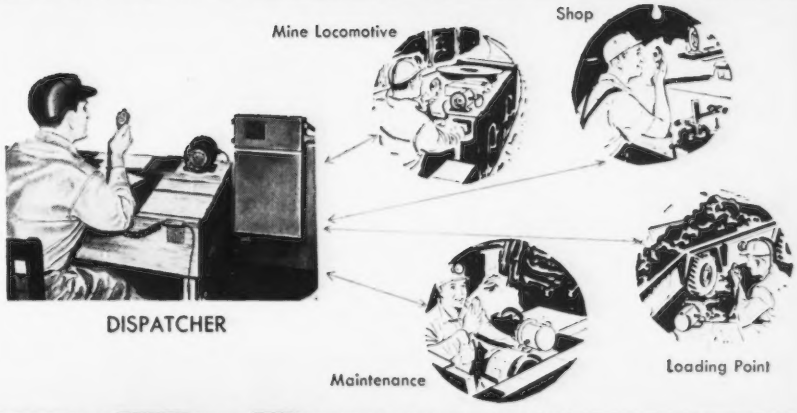

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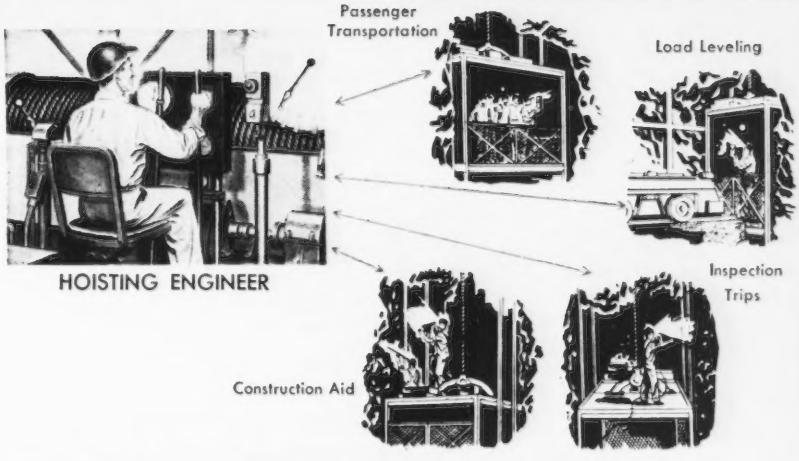

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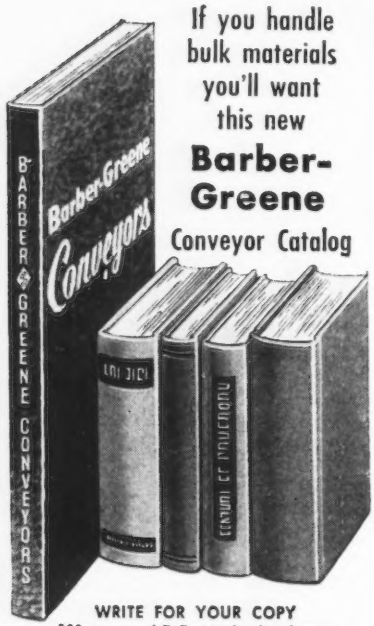

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Letters *(Continued from page 4)*

zincite and calamine) are present, with an efficiency running 81% and with a satisfactory operating cost.

MARCELLO BILLI,
Mining Engineer
Societa per Arioni
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Nossa (Bergamo), Italy

Ed: We sent Mr. Wendt copies of the letters from Mr. Rey and Mr. Billi, and asked for his comment. The following is his reply, which we think answers both letters and provides a great deal of interest in this three-nation, three-ring discussion.

. . . I Stand Corrected

DEAR MR. REY:

I stand very much corrected on my statement concerning the concentration of oxidized zinc ores by flotation. Many of us had the impression that oxide zinc flotation required the use of mercaptans with their intolerable odor and other drawbacks.

Certainly a successful flotation process is badly needed for treating ores from the smaller deposits. Ammonia leaching has, however, some very attractive features for suitably sized deposits such as a high recovery (on the order of 95%); and an extremely pure product. The basic carbonate product contains over 60% zinc which can be increased to almost 80% zinc by calcination. Also, if the solutions are properly purified, it is possible to produce a pure white product which should be directly saleable to the chemical or paint industries. Even if marketed to zinc smelters the product, because of its purity and grade, will command a premium price which should offset the possible higher production cost as compared to flotation.

By-product recovery of such metals as copper and cadmium as relatively pure products is possible where they occur in significant amounts in the ore. Many good points can be developed pointing out the merits of both processes and I am sure that both will find many applications.

I am deeply grateful to you for bringing me up to date on the great progress made in flotation concentration of oxidized zinc ores. The problem was certainly one which challenged the ingenuity of metallurgists for a long time. No doubt future research along this line will develop methods of improving both recovery and grade of concentrates, which although very good, do leave something to be desired at least insofar as the economical exploitation of this type of ore in the United States is concerned.

WILLIAM J. WENDT
Baker, Ore.

Glad To Help

SIR:

I would . . . appreciate receiving . . . permission to have multilithed an article entitled "Roof Sewing" (*E&MJ*, September 1953, p 91). The article will be distributed among Bureau of Mines personnel and (used) to answer inquiries from the industry.

EDWARD THOMAS, *Chief*
Roof Control Section, USBM

Ed: We are pleased to have the Bureau reproduce the article and hope that its wide circulation will contribute to safety.

"A Mineralogical Curiosity"

SIR:

(Regarding the item in "This Month in Mining" *E&MJ*, October 1953, on reported existence of cobalt in Brazil.) The only traces of cobalt here are in the mineral "asbolan," a mineralogical curiosity in low grade manganese ores.

PAULO A. M. DE A. ROLFF
Escritorio de Eng. de Minas
Brazil

Let's have your comments too! Your reactions to articles and features appearing in E&MJ will be welcomed. Address your letters to The Editor, Engineering and Mining Journal, 330 West 42nd Street, New York 36, N. Y.

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PERU

● **Uranium Discoveries.** The mining industry in Peru has been very much in the spotlight lately as the discovery of uranium in the mountains of Central and Southern Peru was officially confirmed. The radioactive substances found in diverse sections of the country have been described by the U. S. Atomic Energy Commission as possessing a high grade of radioactivity. According to a Government decree, the uranium deposits will be developed by private capital. All minerals however, will be acquired and disposed of by the Peruvian Government. A board for the control of radioactive sources will be established to fix a guaranteed scale of prices and control the marketing of radioactive materials.

BOLIVIA

● **According to the last report** of the "Corporación Minera de Bolivia", a government agency, production of minerals have increased in the period January-September 1953, in comparison with the period January-September 1952.

This increase has been made, says the report, under the Nationalization of the Patiño, Hochschild and Aramayo mines. The first anniversary of the nationalization decree was on Oct. 31, 1953.

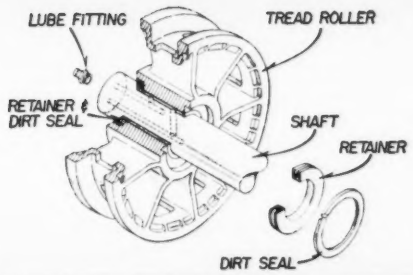
IN AUSTRALIA

● **Drop in prices of metals** has failed so far to affect the expansion plans of local mining industries and all orders placed overseas for equipment and machinery are still being honored. New expansion is being slowed down and predicted new capital investment in this industry will be smaller than in previous year, not including capital expenditure on uranium projects, Australian sources said.

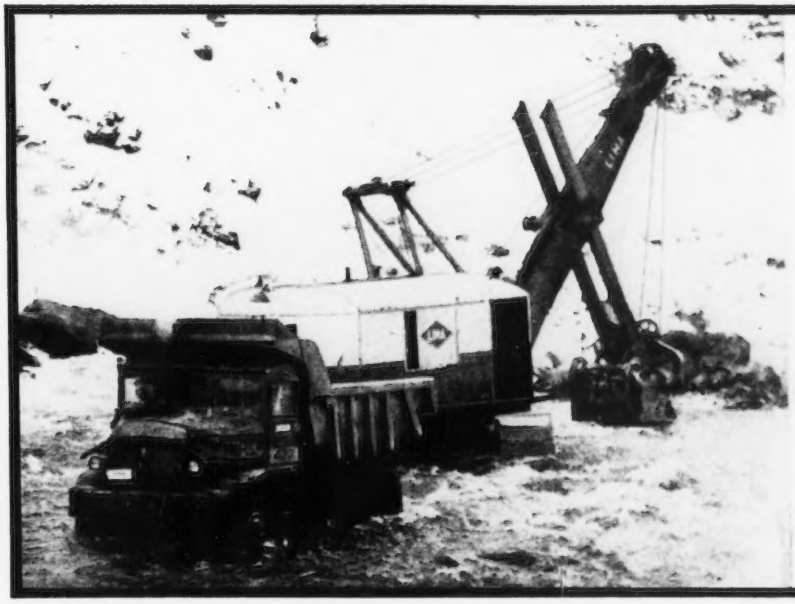
● **Extensive effort** to find tantalum, columbium, beryllium and other rare metals, by a new company, Northwest Tantalum N. L., with a nominal capital of $2.3-million. It will operate in Western Australia. Federal Government will grant a total tax exemption on 20% of output.

● **Claims of the New York Warburg Syndicate** to the rich Bulolo gold fields in New Guinea and to other mineral deposits on that island were rejected by local authorities, it was reported.

● **According to the Commonwealth Bureau of Mineral Resources,** about 900 possible deposits of uranium await investigation by private prospectors in a 1400 square mile area of Northern Territory. All these sites are within 15 mi of either the railroad or the main north-south highway. Airborne scintillometers have detected



LIMA DIRT SEALS CUT DOWN-TIME AND MAINTENANCE COSTS



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Australia *(Continued)*

considerable radioactivity in these areas.

● **Better utilization** of Australian mineral beach sands deposits is again being studied by Government and private experts.

It is estimated that rutile deposits already discovered are so great that they would suffice for an annual production of 10,000 long tons of titanium for a period of over 40 years.

Present reserves of beach ilmenite are also extremely big and geologists assert that further deposits will be located in Australia.

NEW ZEALAND

● **Deposits of perlite** have been discovered in New Zealand in quantities sufficient to warrant commercial exploitation and the discovery has prompted increased interest in the hitherto inadequately examined New Zealand mineral potential.

● **Upper Takaka Valley** activity is continuing in the asbestos fields but annual production is limited to about 700 long tons. The fiber is relatively short and imported product is preferred by local users.

IN ASIA

BURMA

● **Burma government forces** reportedly have wrested control of Mawchi, home of British-owned tin-wolfram mines, from insurgent forces which had occupied the district since 1949.

Reports of the victory filtered back from Mawchi, 150 mi northeast of Rangoon.

After a quick examination, directors of Mawchi Mines said that given reasonable working conditions the mines should again become one of Burma's principal mining operations.

JAPAN

● **Two Japanese zinc refineries** of the Mitsui Metal Co. and the Mitsubishi Metal Mining Co., furnished with new equipment, will start operation this month, according to the companies.

Mitsui Metal Co. has finished installing vertical retort equipment, designed by the Singmaster and Breyer Co. of the United States, a spokesman of the company said. The new equipment could produce 500 tons of distilled zinc monthly.

The spokesman said the vertical retort process had these advantages over the horizontal furnace which had been used at the refinery: (1) man power would be reduced to one-fifth; (2) purity would be 99.5%, compared with 98.5% previously; (3) consumption of coal would be less than half.

Mitsubishi Metal Mining Company has installed a FluoSolid calcinating furnace whose patent was bought from The Dorr Co. of the United States and whose parts were imported, according to a spokesman of the company. He said the company would be able to produce 560 tons of electrolytic zinc and three tons of cadmium monthly with the new furnace.

● **Soviet Union recently offered** to sell Japan 20,000 tons of manganese ore and 20,000 tons of chromite, a spokesman of the Soviet-Japanese Trade Promotion Council has stated. He said the offer had been made in reply to an inquiry from a Japanese trade firm.

According to the spokesman, the manganese ore would have a 48% manganese content and would be shipped from a Georgian mine. He said Russia was asking for payment in cash, but the Japanese firm would like to make it a barter deal against the repair of Soviet ships in Japanese shipyards.

MALAYA

● **October tin concentrate production** was reported at 7,290 tons. Shipments in October were up 650 tons to 5,379 tons.

Meanwhile, it was announced in Kuala Limpur that September exports of tin were 4,727 tons, down almost 1,000 tons from August. Cumulative exports for 1953 through October were 52,471 tons, shipped as follows:

United Kingdom	6,353
U. S. A.	24,462
Europe	10,384
British Possessions	5,203
Other countries	6,069

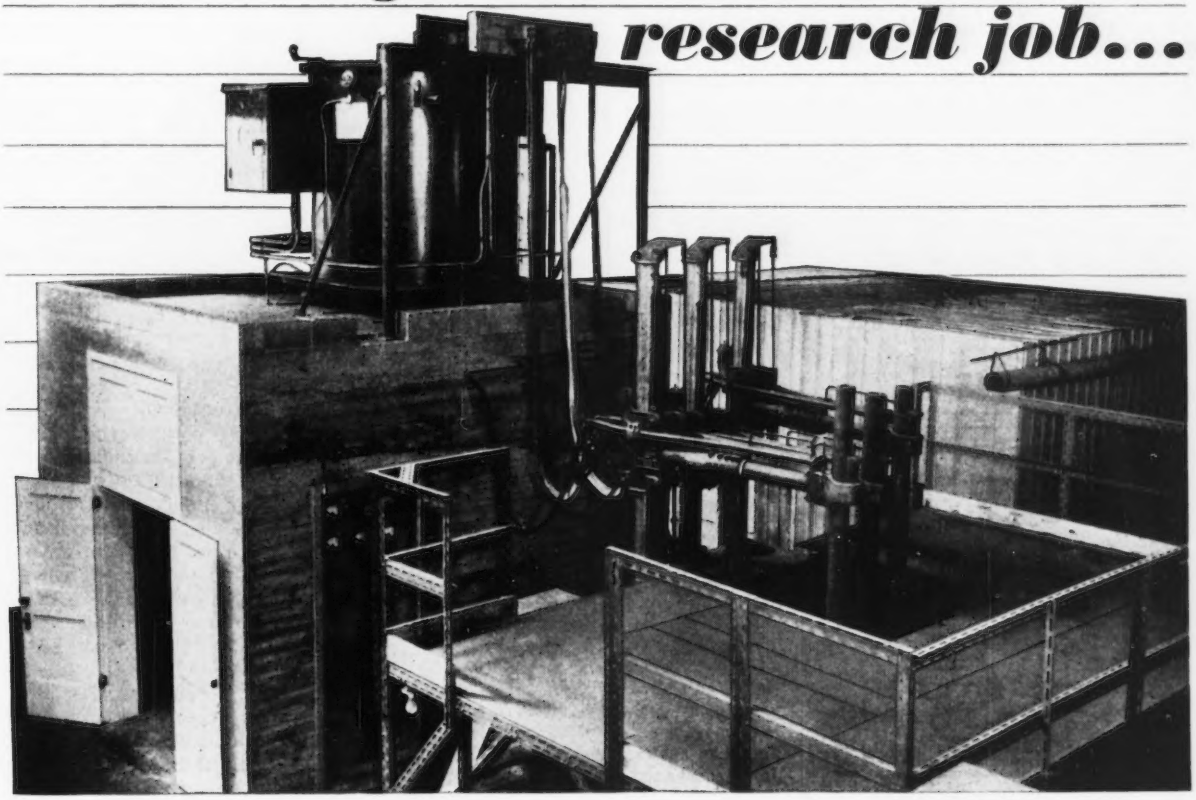
Third quarter tin production is reported for the following mines:

Chenderiang Tin	25.4 tons
Gopeng	140.5 tons
Hongkong	69.8 tons
Kent	124.8 tons
Kinta Tin	115.2 tons
Killinghall	41.9 tons
Malaysiam	37.2 tons
Pengkalen	88.4 tons
Petaling	546.7 tons
Pusing	97.6 tons
Rambutan	24.4 tons
Tanjong Tin	277.3 tons
Tekka	44.1 tons
Teluh Kruin	52.5 tons
Tekka Taiping	71.4 tons
Kinta Kellas	88.4 tons

● The English-language newspaper, **Singapore Standard,** reported that the World Bank Mission to visit Singapore and Malaya this month will make the first full survey of Malaya's economic needs.

The mission would assess the amount of a World Bank Loan to the

*Lectromelt** goes to Canada on a research job...



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Cheap electric power and plentiful mineral resources have led to Canada's exploration of the economies and efficiency of electric smelting. A laboratory has been set up to test high temperature smelting and to determine whether more desirable products can be obtained more practically by using electric furnaces.

Highly satisfactory results already have been obtained in test production of ferroalloy-type material, according to the Division Chief heading the laboratory.

It is anticipated that certain ores will be smelted experimentally to obtain informative data on costs and chemical reactions encountered. Also, the smelting problems of various refractory materials will be investigated.

Expectations are that the cost of the pilot laboratory will be insignificant compared with the economies and material improvements that will result from this Canadian research. Perhaps you could benefit similarly by installing comparable research facilities.

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Malaya *(Continued)*

Malayan Peninsula from its judgment of national development needs.

The newspaper quoted sources in Kuala Limpur as saying the mission would concentrate on five main points:

1. Expansion of iron ore mining as a third industry for the Peninsula;
2. Increase of rice production to make Malaya self-sufficient;
3. Development of electrical power including the construction of a 100,000-kw hydro-electric station in the Cameron highlands;
4. Encouragement of secondary industries such as rubber manufacturers and foundries for local raw materials;
5. Replacement and improvement of the Malayan railways rolling stock.

IN EUROPE

PORTUGAL

● **New equipment** worth about $3-million is being installed at the iron ore mines in Sirigao, Portuguese India, according to reports in Lisbon. The deposits at Sirigao have been worked under license since 1951 by the Kokan Mining Co. of Japan. Japanese technicians have supervised mining operations, and financial assistance has been provided by a group of Japanese banks.

ENGLAND

● **Duncan Sandys, Minister of Supply,** told the House of Commons that whereas several pockets of uranium have been found in Cornwall, none of the deposits are large enough to warrant the expense of mining and treating the ore.

GERMANY

● **A two-year contract** for the sale of copper was concluded in Santiago on Nov. 27 between medium-sized and small Chilean copper producers and the Norddeutsche Affinerie, of Hamburg.

Cananea Blast

(Continued from page 94)

broke into smaller fragments. It should be noted that even with the same numbered delays in each line, if they had not been started in correct order, the crisscross slabbing stresses would have been lost. Compare Fig. 5 and 6 on p 94.

The direction of the crisscross slabbing stress was determined as in Fig. 8, which is an enlarged view of a stress polygon from Fig. 5. The arrows indicate the directions of stresses. Triangles 1 and 2 with their respective stress arrows gave a combined resultant stress which was the major part of the force from these two blast holes and which produced the slabbing action. There was a minor stress with the direction as shown in polygon 3. This minor stress did not add to the slabbing action. The shaded area between the major and minor stresses was broken but not by the direct force of the blast holes.

Theoretically, the best crisscross slabbing action would have been obtained if the burden to spacing ratio had been a one-to-two ratio as in Fig. 7. However, although this round with a one-to-two ratio might have yielded the best fragmentation from slabbing stresses, fragmentation is also dependent upon other items such as the size and length of the holes, the rock type, the fracture pattern, and the type of powder. Each mine and even areas within each mine have different characteristics, and the most economical burden and spacing must be found by trial and error.

The author gratefully acknowledges the encouragement and cooperation received in the preparation of this manuscript from Roland A. Sheldon, general mine superintendent, and to Alvin J. Fenn, mine superintendent, of the Cananea Consolidated Copper Company, S.A.

Yerington

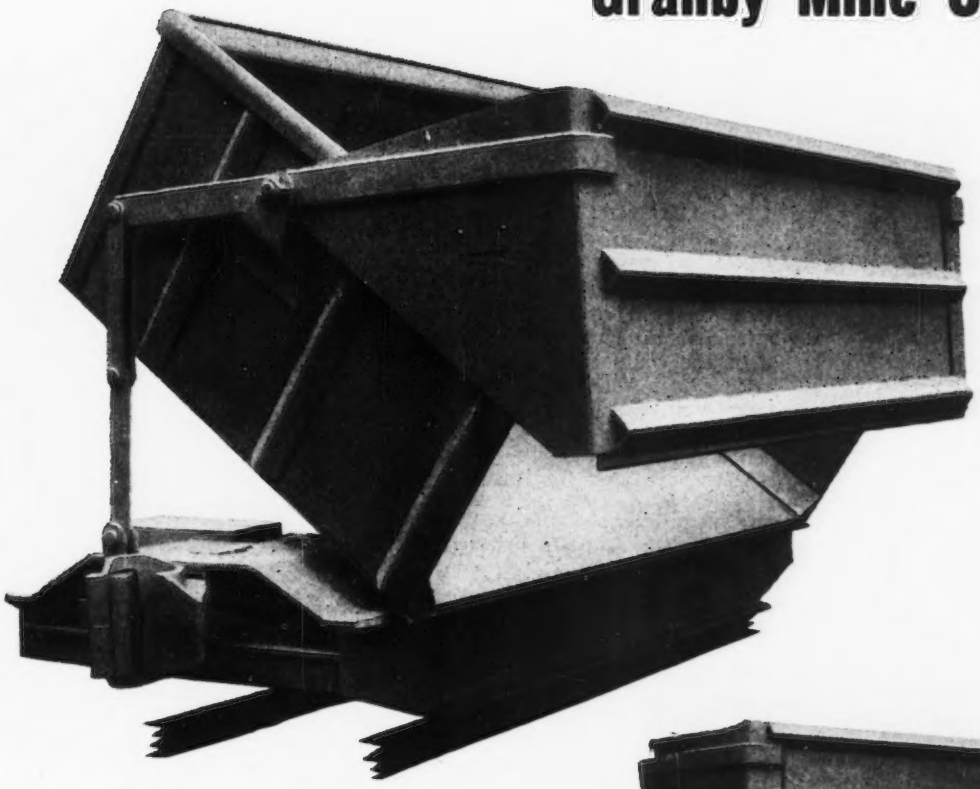
(Continued from page 113)

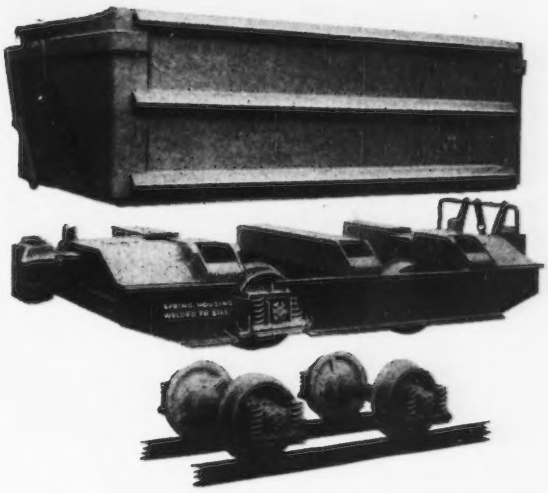
500 lb including the tractor. Loaded with sulphur, total weight averages around 70,000 lb. This is under the maximum State load limits. The vehicle rolls on 20 tires and carries several spares for emergency use. Trucks are equipped with Speedographs that register the actual speed on a chart which is examined and recorded at the end of the day's run. Trucks are governed at 55 mph. The big diesel trucks average about 2,000 gallons of fuel per day, with the company paying a fuel oil tax of 5½c to the state and 2c to the Federal Government. Figures released by Wells Cargo indicate that $30,000 would be paid during a nine month period in highway use taxes over the Yerington mine-Leviathan highway route.

Three separate materials-handling bridges, each of a different type, play important roles in Anaconda's Weed Heights flow sheet. A traveling loading bridge, a traveling unloading

SANFORD-DAY builds an Improved

Granby Mine Car . . .





Here's simple and practical construction. Remove four pins and eight bolts and the S-D Granby Car can be completely disassembled in 10 minutes.

Briefly, this new S-D Granby Car features: (1) outside frame undercarriage, (2) outside spring truck boxings, (3) automatic coupler mounting, (4) stronger body and (5) all-welded design in which each member serves one or more purposes.

Some of the advantages of these features are: greater capacity for any specified dimensions because body hinge points are located outside of wheels . . . better trackability and stability on narrow gauges because the low bottom and wide frame give a low center of gravity . . . easy access to all parts of truck and boxing for maintenance because entire axle, wheels, boxings and spring assembly may be dropped out of frame by removal of only eight bolts . . . maximum shock absorption for any shock or load condition . . . no pinching of bearings . . . no weak spots . . . heavy ¾" bottom plate giving longer life and lower maintenance. Valley angles, gussets, vertical and horizontal stiffeners are used on the body for maximum strength. The all-welded construction is designed so that all joints and connections equal parent metal strength.

If you are now contemplating the purchase of new Granby Cars, it will pay you to get complete specifications and construction data on this improved car.

SANFORD-DAY IRON WORKS, Knoxville 17, Tenn.

Yerington *(Continued)*

bridge and a 10-ton traveling gantry crane were especially designed for the Yerington mine by Heyl and Patterson, Inc., Pittsburgh, Pa. The loading bridge and the unloading bridge work in conjunction with each other over the leaching vats at the plant, one loading material into the vats and the other unloading material from the vats after the leaching operation.

The loading bridge straddles the leaching vats by running on rails on either side. This bridge is capable of loading 1500 tons per hour of ⅜ in. material weighing 100 lb per cu ft. The bridge travels a total distance of 970 ft over the eight vats at the rate of 54 fpm.

The unloading bridge travels over the same leaching vats as the loading bridge. It also straddles the vats, but travels on separate rails so that it can pass over the loading bridge at any point. The unloading bridge is equipped with an 8-ton clamshell bucket and can unload the leaching vats at the rate of 900 tons of residue per hour.

Material from the vats is deposited from the bucket into a 120-ton capacity hopper located at the tower end of the bridge. The trolley travels the entire span of the bridge and the bucket can dig from any part of the leaching vats. The bridge can travel at the rate of 52.7 fpm over the 1,000-ft rails.

The third Heyl and Patterson installation is a 10-ton man-trolley traveling gantry crane which straddles and operates over the precipitation launders. It is equipped with a large clamshell bucket and a lifting magnet because it serves a twofold purpose. All movements are electrically controlled.

The lifting magnet is used to charge iron into the cementation launders each day. This is done at the rate of 10 to 12 tons per hour. The bucket is used mainly to remove copper precipitates from the launders to trommels for washing and then to drying areas.

The gantry crane can travel at the rate of 200 fpm over the 720-ft rails. Both bucket and magnet can be lowered to a point 10 ft below the top of the runway rails to pick up or discharge materials.

Weed Heights, the town named after C. E. Weed, the company's vice president in charge of operations, consists of 250 housing units. These homes are modern in every respect and are equipped with the latest design in stoves, refrigerators, automatic washing machines, and space heaters.

These houses are rented to company employees for from $20 to $30 a month, depending on the size of the home. The rental includes free water, and electric power is sold to the occupants at cost. There are now a swimming pool, tennis courts, softball field, basketball courts, playgrounds for the children, and a recreation hall for social events. A recreation club composed of Anaconda Copper Co. employees has full charge of the recreational facilities on the property.

Officials at the Yerington mine whose efforts culminated in the successful completion of the company's project include A. E. Millar, general manager; H. R. Burch, mine superintendent; Allison J. Gould, plant superintendent; James Wordie, construction engineer; Ken Humphreys, personnel director.

Cyclone Grinding

(Continued from page 95)

test work in the Hanna Beneficiation Laboratory.

In the course of certain batch cyclone test work in which an attempt was being made to develop a concentration process using autogenous media, it was observed that the iron ore used for testing was higher in grade after the tests were run than it had been before they were started. In other words, a differential grinding effect was observed.

To prove that this differential grinding effect was actually taking place, a series of tests were conducted in which all the factors were carefully controlled. These tests proved, that if certain operating conditions were followed, the cyclone actually acted as a quite selective differential-grinding mechanism. This will be apparent from the following report of these tests.

A large sample of minus 3/16-in. classifier rake product from a mine treating a Mesabi Range "intermediate" ore was obtained and thoroughly mixed so as to be as uniform as possible. The sample was then riffled into a number of smaller test work samples. A head sample of this material was carefully sized and each screen size was analyzed. The results are shown in Table 1.

For the differential-grinding tests on the cyclone, a set-up for batch testing were used substantially as shown in the illustration. This consisted of a sump, with a valve in the bottom, in which the ore sample and water was placed. The valve was then opened and the sample run into a 2-in. Wilfley-type sand pump which pumped the pulp into a cyclone 6 in. in diameter mounted over the sump. Cyclone overflow and underflow mixed together and were repumped back into the cyclone, if desired. In the course of these tests it was observed that a greater grinding effect was obtained if the air relief valve, as indicated in the drawing, was open.

In the tests, the ore was pumped through the circuit for a calculated number of times and the sample was then carefully removed from the pump and sump. It was then dried and riffled into a small sample for screen analysis. Data obtained in two typical tests are presented in Table 2. When these are compared with those in Table 1, it will be noted that a very definite differential-grinding effect was obtained in the batch cyclone circuit.

On the Mesabi Range, a considerable number of concentrators use a ball mill for testing material similar to this ore sample by means of the "abrasion milling" process, which is a type of differential grinding. To show the effect that would be obtained by abrasion milling, a sample of the same material used for the above cyclone tests was subjected to the standard laboratory abrasion milling procedure. The results are shown in Table 3.

Pump Not Responsible

After reviewing the foregoing data, the question of whether the pump and pipeline turbulence caused grinding of the ore was naturally asked. Therefore, a set-up was used similar to the one employed for the cyclone tests except that, in place of the cyclone, a length of pipe was substituted. This pipe was four times the length of pipe used previously and had a full, non-restricted discharge into the sump. A test was run on the ore with the same procedure used in the previous tests. The results of this pump and pipe-line test are given in Table 4. They indicate that there was relatively little abrasion in the pump and pipeline only. That is, the cyclone effect was considerably greater and also more selective.

Whether this would be a commercial process for differential grinding, it is difficult to say without an extended development program and a thorough economic analysis. Most of the properties on the Range where the abrasion milling process can be applied successfully are already equipped with ball mills and, therefore, there is not enough incentive to develop this observation further.

However, this information is being presented in the hope that it may aid other experimenters who notice discordant results when testing cyclones, particularly on a batch scale.

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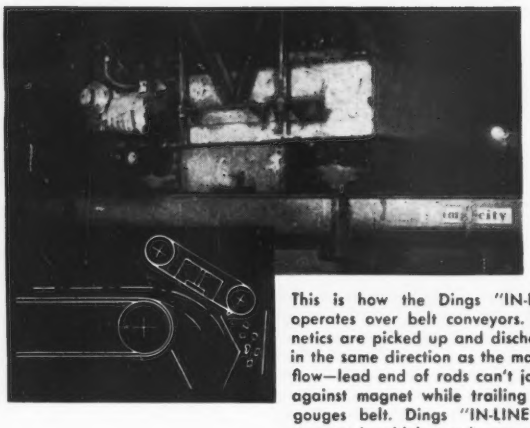

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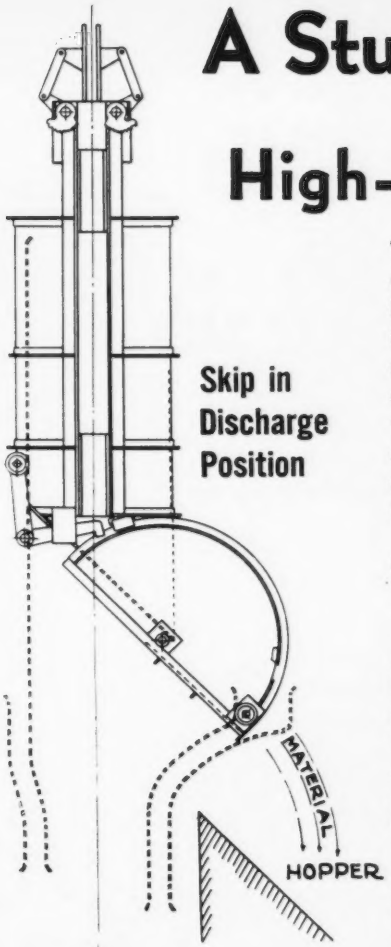

Skip in Discharge Position

The modern 6-metric-ton skip here illustrated is one of several similar units recently furnished for service in a foreign country where reliability is an even more important consideration than usual. Its simple sturdy design and equally simple operation gives all the well-known advantages of bottom-discharge skips, with respect to quick dumping and balanced hoisting, at minimum expense for construction and maintenance of both the skip and the headframe.

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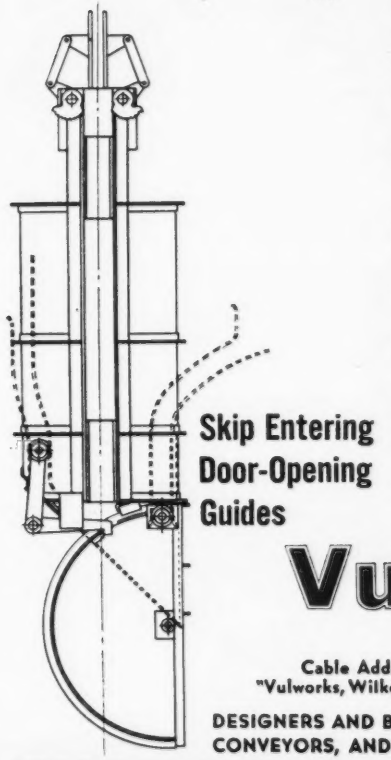
As shown by the accompanying diagrammatic illustrations, dumping is accomplished, without unbalancing the hoist, by means of two sets of "guides" one of which opens the latch as the skip moves into the dumping position while the other swings the door (to the right) so that it becomes an extension of the 45-degree skip bottom and provides an overlapping chute through which the material passes to the hopper without danger of any part of the load falling into the shaft. This gradual opening of the door not only minimizes breakage but also reduces shock to the hopper and its supporting structure.



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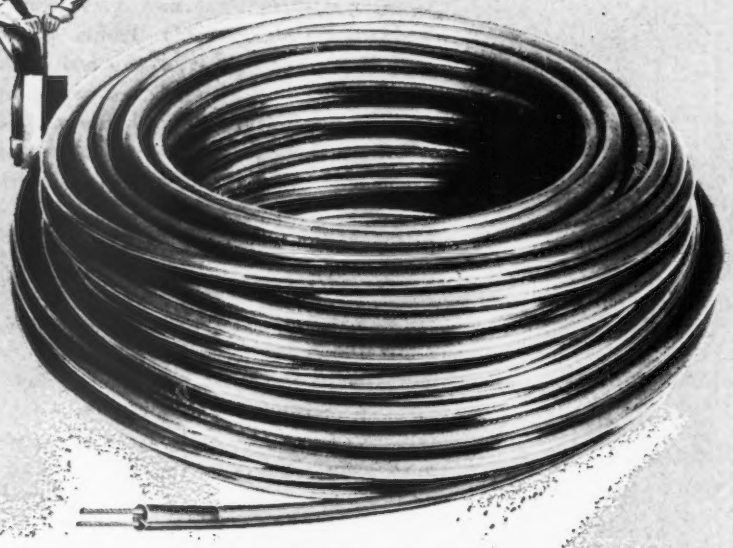

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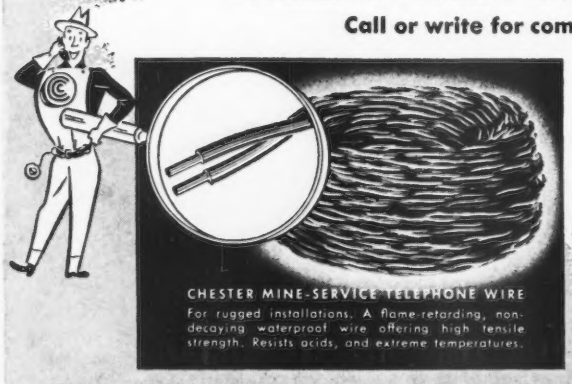

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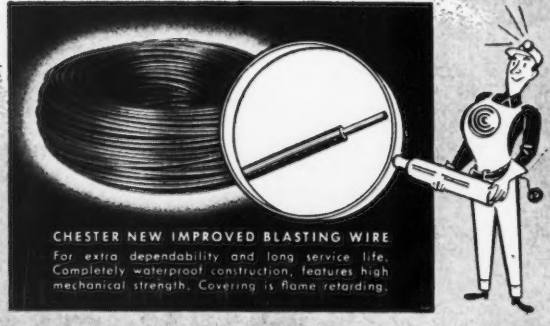

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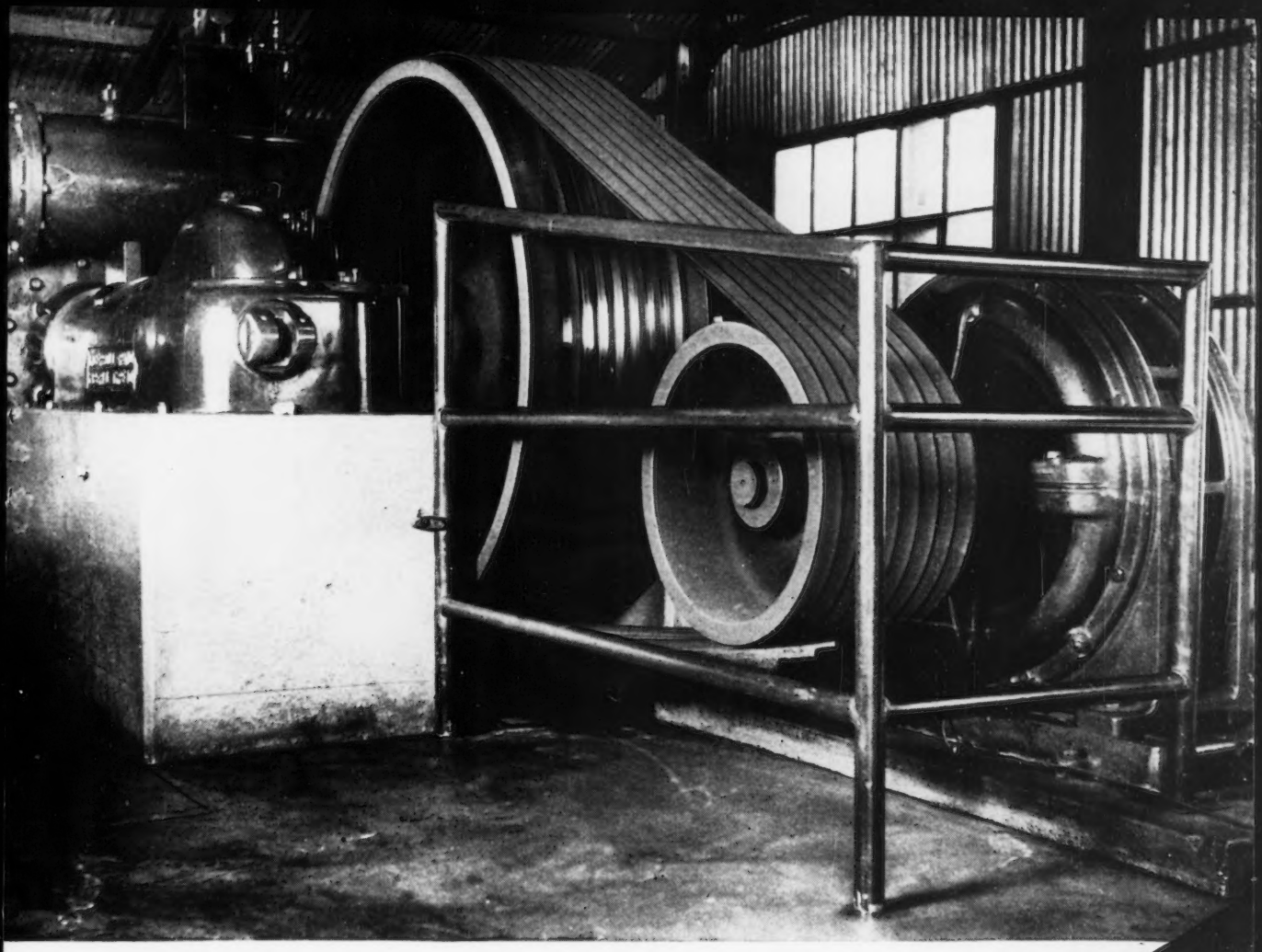

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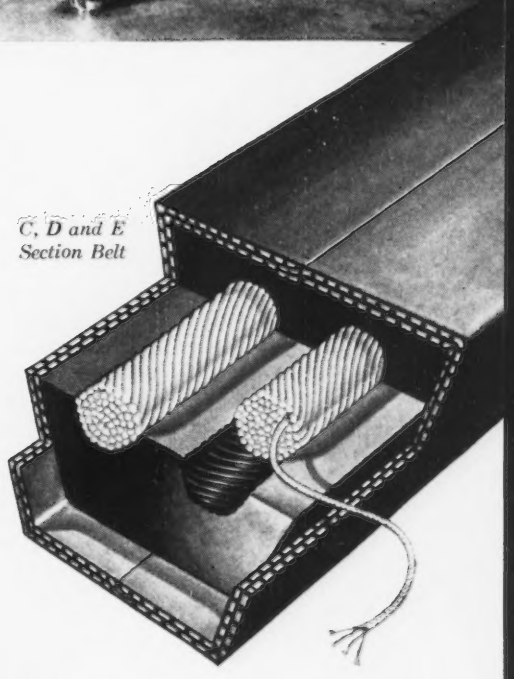

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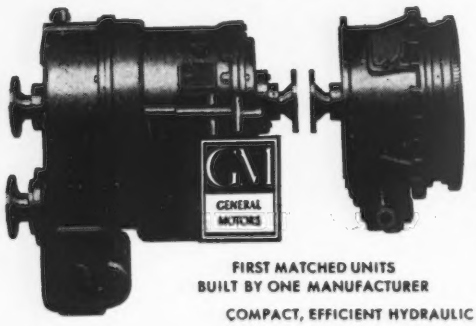

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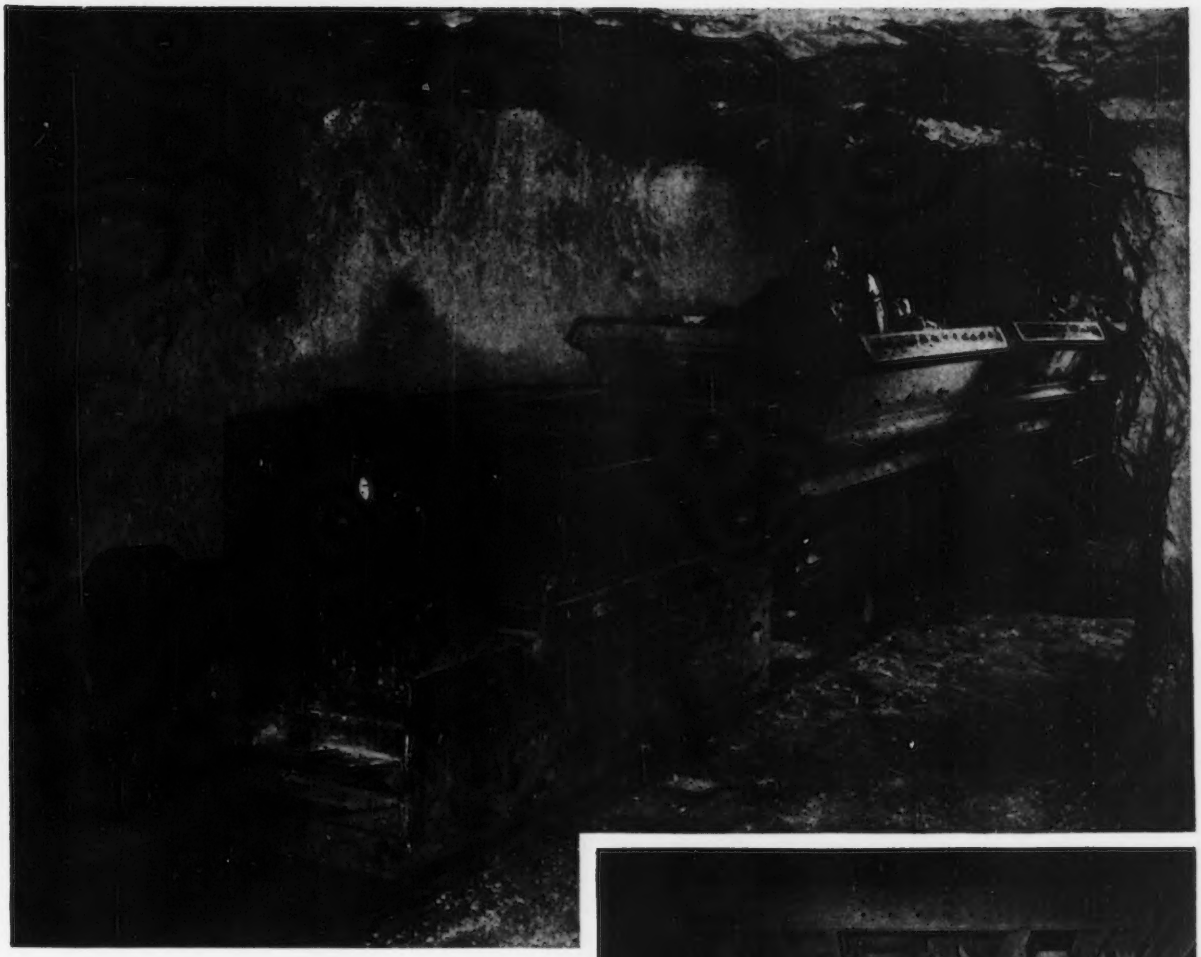

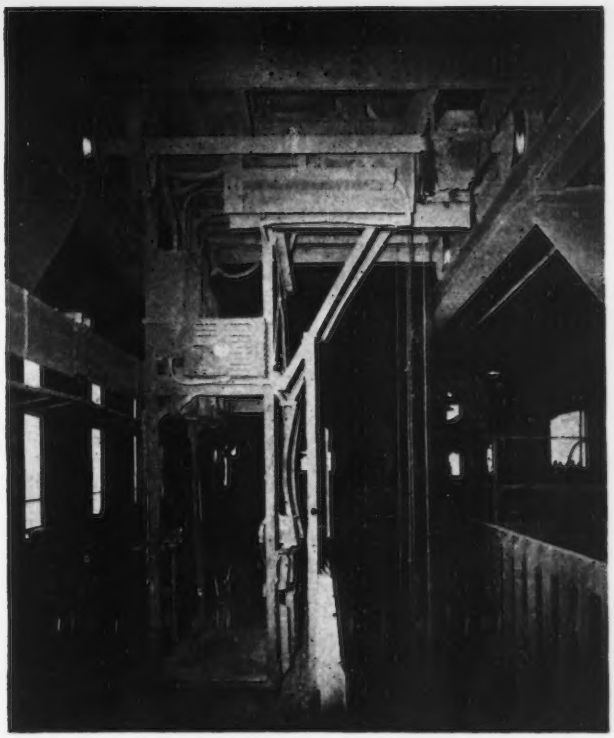

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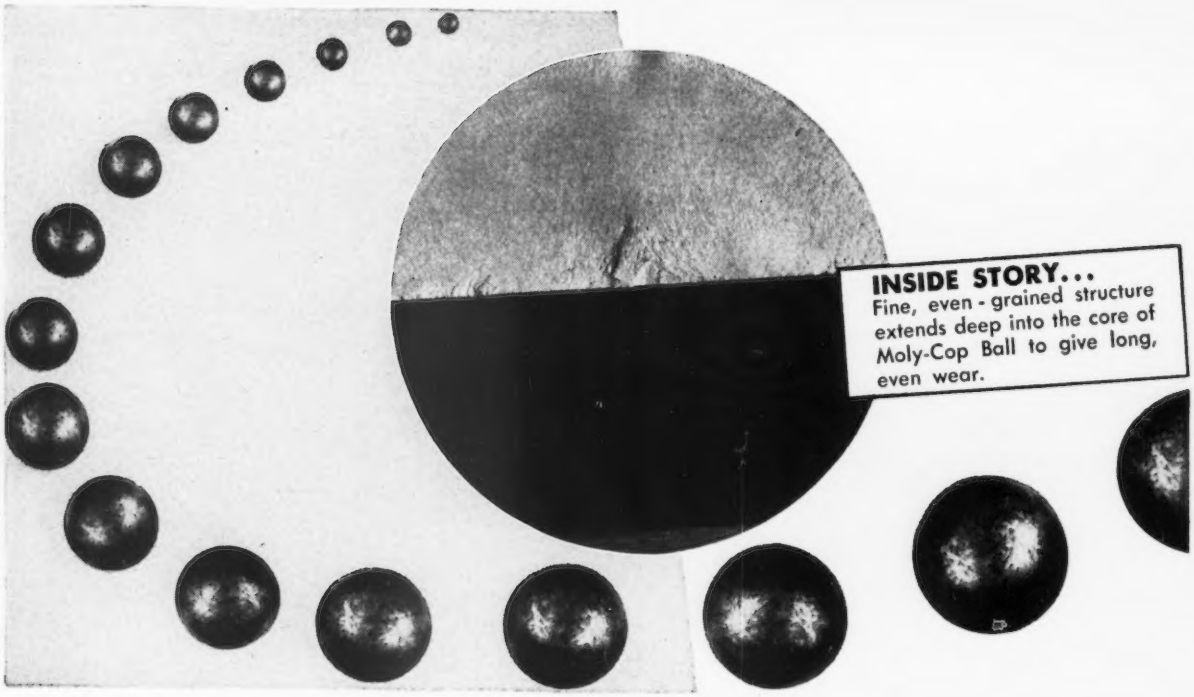

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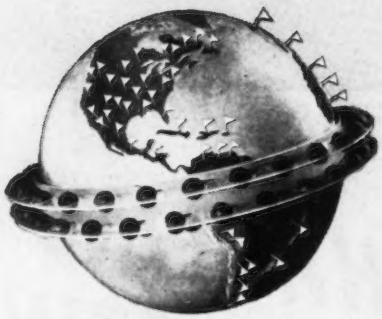

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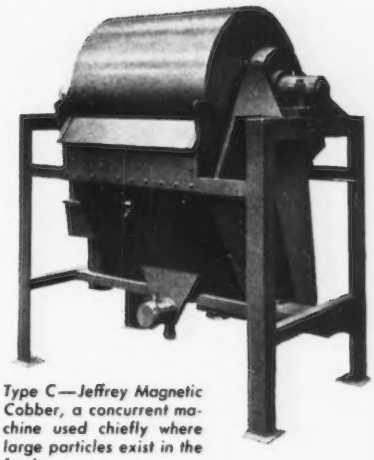


Type C—Jeffrey Magnetic Cobber, a concurrent machine used chiefly where large particles exist in the feed.

WRITE FOR DESCRIPTIVE LITERATURE AND TECHNICAL DATA.

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

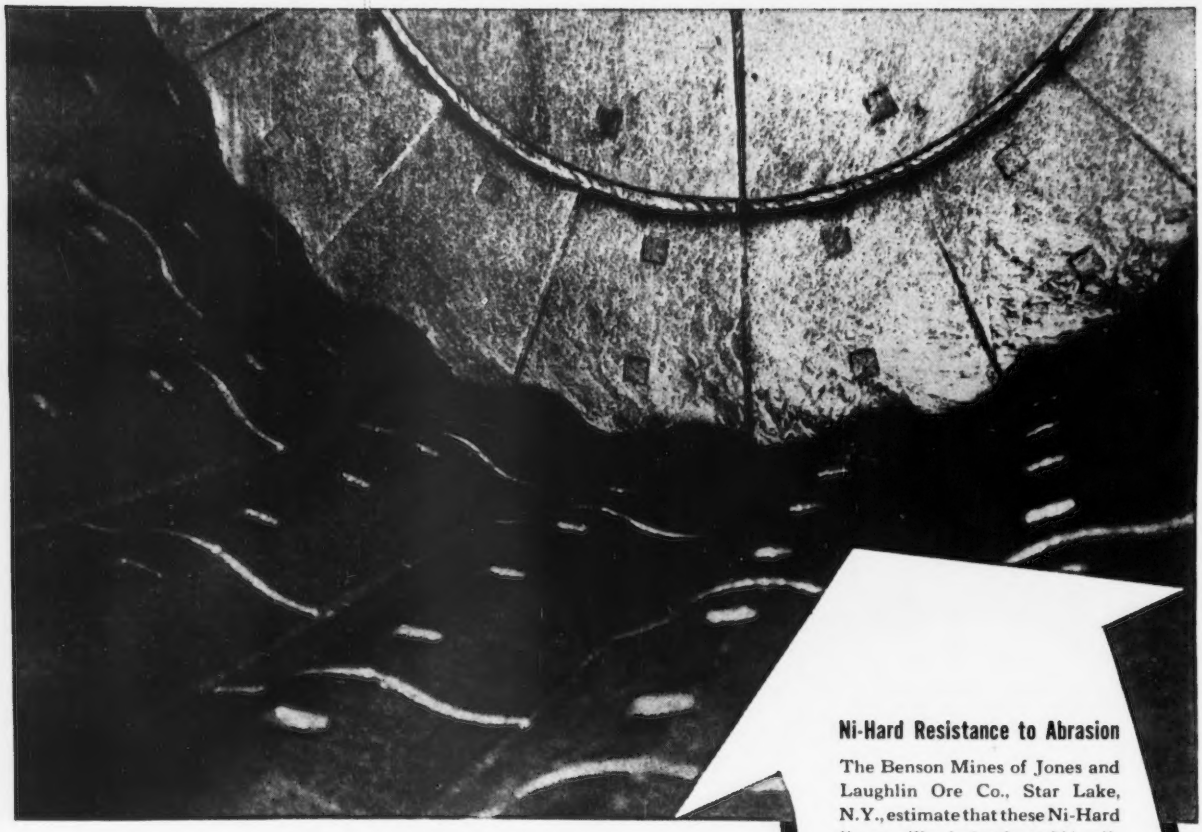
Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED

. . .IT'S A JOB FOR JEFFREY!



Ni-Hard Resistance to Abrasion

The Benson Mines of Jones and Laughlin Ore Co., Star Lake, N.Y., estimate that these Ni-Hard liners will grind at least 2½ million tons of ore—which means 3 to 4 times better service than that obtained from manganese steel liners previously used. Cast by Plattsburg Foundry & Machine Co., Plattsburg, N. Y., an authorized producer of Ni-Hard castings.

After Grinding 2,000,000 tons of Iron Ore these Ni-Hard Liners are still in service

1,040,000 TONS OF ORE were ground during the first 14 months after installation of these Ni-Hard® liners. The photograph, taken at the end of that period, shows them to be in excellent condition. Actual measurement showed less than 10% wear . . .

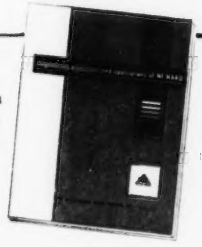
And after grinding more than 1,500,000 tons of ore, they showed total wear of about 25%. By comparison, liners of austenitic manganese steel were completely worn out after grinding 600,000 to 800,000 tons of ore.

Ni-Hard, a nickel-chromium white iron of moderate cost, is produced under foundry controls to meet INCO's high standards. Ni-Hard is obtainable from authorized foundries, coast-to-coast, in all shapes common to the foundry industry.

Call on our 20 years' practical experience in the Ni-Hard field to determine how this wear-resistant material will *stand the gaff* in your equipment.

The completely revised third edition of "Engineering Properties and Applications of Ni-Hard" is now available. Write for your copy today.

INCO

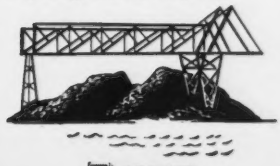


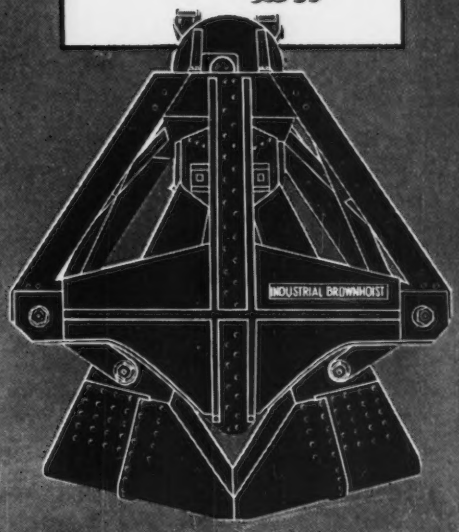
THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

BROWNHOIST

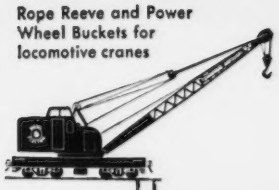
ALSO BUILDS BETTER BUCKETS

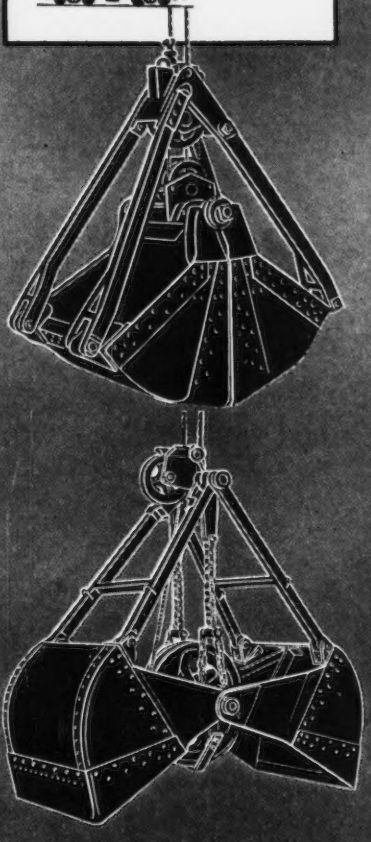
Link Type Buckets for boat unloaders, bridge cranes, fast plants





Rope Reeve and Power Wheel Buckets for locomotive cranes

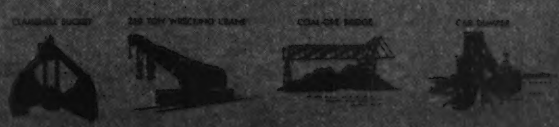




Brownhoist Buckets are designed for specific jobs and especially engineered to meet the toughest materials handling requirements. They take deep, full capacity bites that move more materials per lift, thus making possible considerable savings in man-hours and production time. They are built for endurance and dependability, the same qualities that have accounted for Brownhoist leadership in the bulk materials handling field for more than three quarters of a century. Railroads, steel mills and dock operators who are loading and unloading coal, ore, slag or other bulk materials will find it pays to discuss their requirements with Brownhoist engineers.

164

BROWNHOIST builds better cranes



INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Cleveland, San Francisco, Chicago; Canadian Brownhoist, Ltd., Montreal, Quebec • AGENCIES: Detroit, Birmingham, Houston, Los Angeles

RIGHT ANGLE
Roller Ends

RIGHT ANGLE
Bearing Surfaces

RIGHT ANGLE
Separator Slots

Longer operating life? Right! Less maintenance? Right again!

Heavy-duty equipment "rolls right" with Rollways because . . .

. . . solid cylindrical rollers provide the long line-contact required by heavy loads.

. . . precisely made ends, bearing surfaces and retainer slots restrict end-rub, skew and side-shock.

. . . special alloys in the races resist spalling and brinelling.

It all adds up to a bearing that rolls longer, takes less maintenance, prolongs the life of your equipment.

ROLLWAY BEARING CO., Inc.
SYRACUSE, N. Y.

• No charge or obligation for our bearing recommendations. Bearing replacement distributors in principal cities—consult classified phone directory.

ROLLWAY
BEARINGS

Complete Line of Radial and Thrust Cylindrical Roller Bearings

SALES OFFICES: Boston • Chicago • Cleveland • Detroit • Houston • Los Angeles • Philadelphia • Pittsburgh • San Francisco • Seattle • Syracuse • Milwaukee • Toronto

Confidence...

A STATE OF MIND
THAT GOES WITH
J&L WIRE ROPE

CONFIDENCE IN Quality

because J&L stands for:

1. Quality-tested steel wire
2. Uniform fabrication of strands
3. Wires and strands in perfect balance
4. Special lubrication of strands
5. Accurate construction (true to round)
6. Resistance to bending fatigue

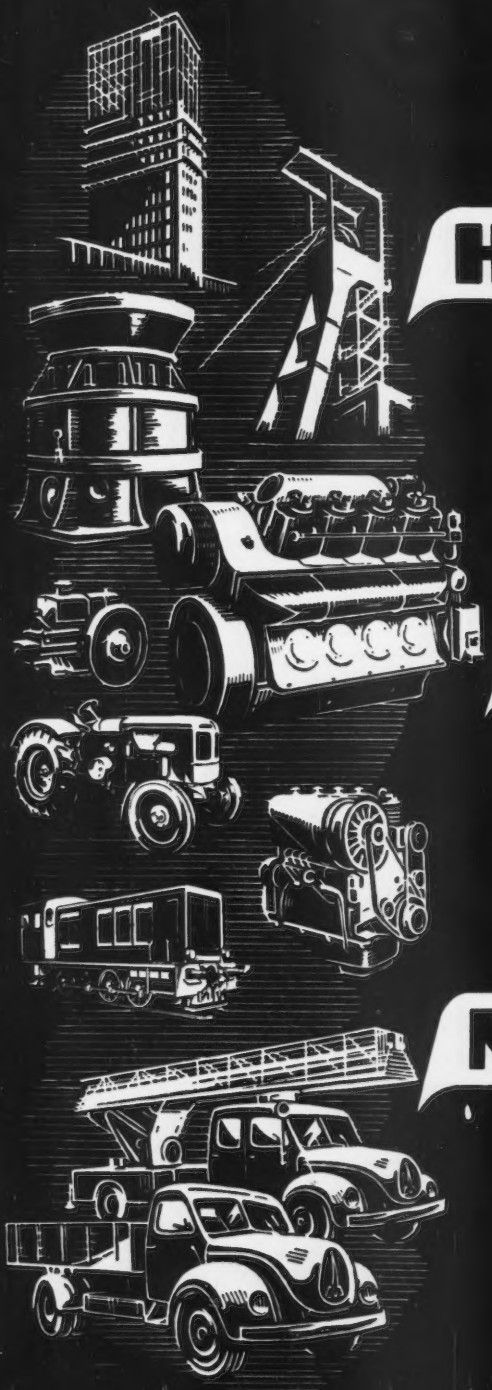
CONFIDENCE IN Service

because you can depend upon J&L Distributors and Sales Offices for:

1. Quick, efficient delivery
2. Complete stocks near at hand
3. The right rope for every job
4. Technical service by Wire Rope specialists

JONES & LAUGHLIN
STEEL CORPORATION
PITTSBURGH

J&L STEEL



SINCE 1856

HUMBOLDT

Mines Equipment, Mineral Dressing Plants, Crushing and Grinding Machinery, Cement Factories, Metallurgical Works, Coal Preparation Plants, Steel Constructions for Buildings and Bridges.

SINCE 1864

DEUTZ

Otto-, Gas-, Diesel-Engines for Every Purpose of Two- and Four-Stroke design, Output range 3-1650 H.P. Cooled by water or air, Diesel-powered tractors, Diesel locomotives, Gas producer plants.

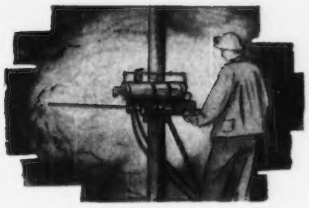
SINCE 1864

MAGIRUS

Trucks and busses driven by air-cooled DEUTZ Diesel engines, Vehicles for municipal services, Fire ladders, fire engines, Fire fighting water trucks, Two-wheeled ladders, Fire fighting equipment.

KLÖCKNER-HUMBOLDT-DEUTZ AG · KÖLN

ENGINEERED TO GIVE LOWEST COST PER FOOT...



Through ★ **LONG WEAR**
★ **RAPID PENETRATION** ★ **HIGH DIAMOND RECOVERY**

For soft, hard or variable rock formations—For core drilling or blast hole drilling—For maximum cutting speed plus most economical footage under the roughest hole conditions—J. K. Smit offers a complete line of Diamond Drill Bits and Reamer Shells, manufactured in our own plant under closely controlled conditions.

Every Diamond is carefully selected, graded and set in a matrix specifically designed for best results in whatever type of formation is encountered:

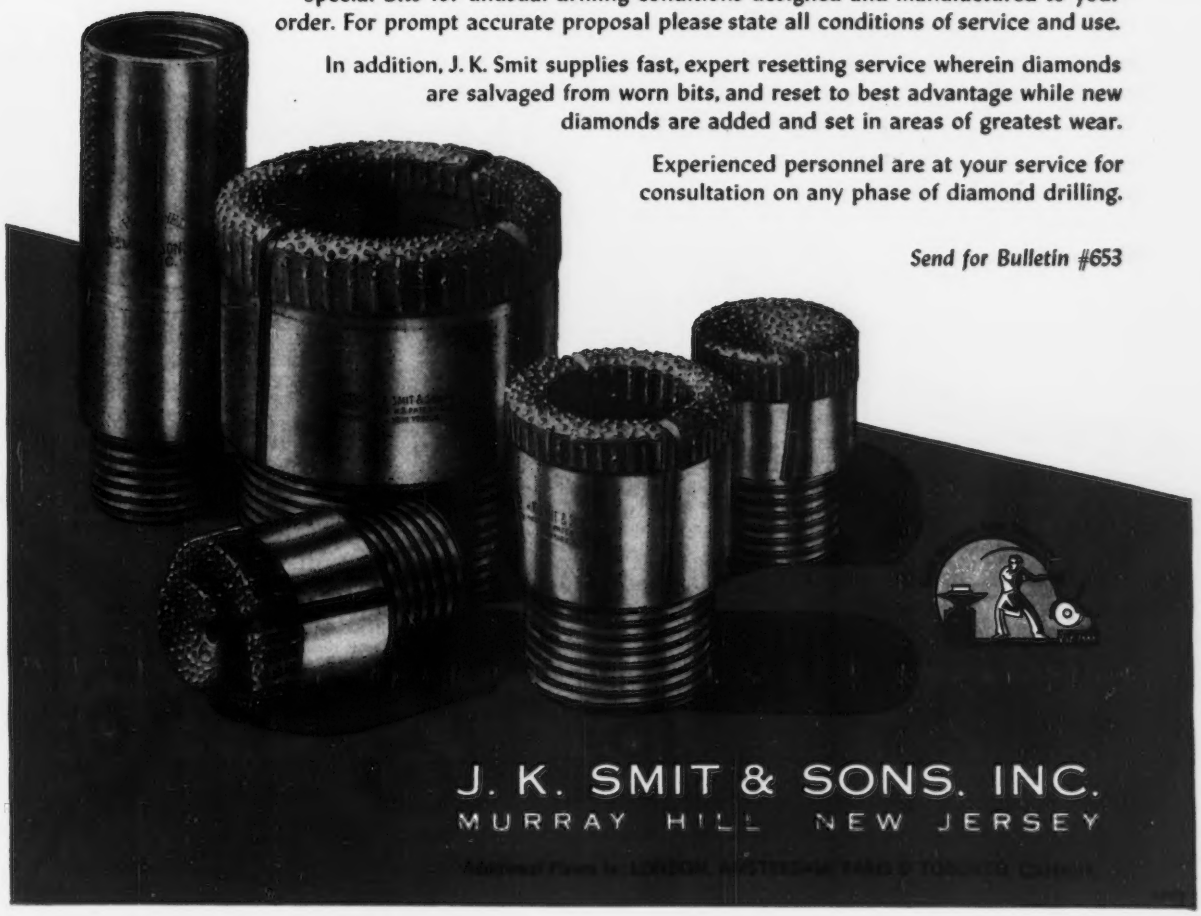
specify HARDHED matrix for non abrasive formations.
specify HARDHED 40 matrix for average conditions.
specify HARDHED 55 matrix for extremely abrasive formations.

Special Bits for unusual drilling conditions designed and manufactured to your order. For prompt accurate proposal please state all conditions of service and use.

In addition, J. K. Smit supplies fast, expert resetting service wherein diamonds are salvaged from worn bits, and reset to best advantage while new diamonds are added and set in areas of greatest wear.

Experienced personnel are at your service for consultation on any phase of diamond drilling.

Send for Bulletin #653



J. K. SMIT & SONS, INC.
MURRAY HILL NEW JERSEY

KEEP PRODUCTION *High*

KEEP COSTS *Down*

with this

Modern, Deep Frame,

BIRDSBORO-BUCHANAN

Jaw Crusher

12 OUTSTANDING FEATURES OF BIRDSBORO-BUCHANAN DEEP FRAME JAW CRUSHERS

1 Latest advanced design and construction for maximum production.

2 Completely redesigned all cast steel frame . . . deeper and stronger.

3 New water-jacketed main frame bearings are removable.

4 New aligning rings, on swing jaw frame clamping boxes, speed re-zincing when necessary.

5 All joints accurately machined and doweled for quick assembly in the field.

6 No side movement or shifting of jaw plates (no zincing is required).

7 New arrangement of jaw plate toe lugs permits 50% more wear off plates before they must be replaced.

8 Completely automatic lubrication to all parts of crusher cuts your power and maintenance costs.

9 New, longer swing jaw brings you faster crushing to smaller sizes.

10 Newly designed toggles have renewable flame hardened ends. Can be quickly and cheaply replaced. Eliminates cost of new toggles to correct end wear.

11 Special pitman cuts upkeep and repairs 50%. New design holds weight down to minimum without sacrificing strength.

12 Removable water-jacketed cap, adjustable for wear, allows quick rebabbitting.

Crushers Available in These Sizes

24" x 36"—30" x 42"
36" x 48"—42" x 48"
42" x 54"—48" x 60"
60" x 84"—66" x 84"

World-Wide Agent Representation.
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JOHN INGLIS & CO., LTD., TORONTO, CANADA

BIRDSBORO

BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA.

BIRDSBORO BUCHANAN JAW CRUSHERS

CR-6-51-R

Offices in Birdsboro, Pa. and Pittsburgh, Pa.

•***designers and builders of:*** Crushing Machinery • Hydraulic Presses • Steel Mill Machinery • Rolls • Special Machinery • Steel Castings

PRODUCTION RESUMED IN 3 DAYS

after $1,000,000 fire at C&D Batteries, Inc.

C & D President, Leon A. Doughty pulls switch to start charging operations.

C & D's block-long plant in Conshohocken, Pa. at the height of the fire, Sunday, November 29.

Despite a $1,000,000 fire that destroyed the main buildings, offices, engineering department, and laboratory of C & D's plant on Sunday, November 29, 1953, production was resumed in three days.

On Tuesday, December 1, space was leased in a nearby plant for setting up new production facilities. On Wednesday, December 2, new batteries that had escaped the fire were being charged on new lines, and grid casting was begun next morning.

The new facilities were in operation on December 10. The salvaged portions of the main plant and the leased facilities were combined to achieve full production by Christmas.

We thank our customers for their patience in bearing with us during delays in shipping, and assure them that the high quality of C & D products is being maintained. *We are deeply grateful to our many friends who have generously given us their kind understanding and support.*

Philadelphia Inquirer Photos

30 M Stick

PAN day) (J Korea refused ing to resisted tion.

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Two Men Seized in Bakery Holdup

Two holdup men were captured by police late last night, within 15 minutes after they robbed a bakery, on Dryrum ave. near Oster st., of $122.

The robbery occurred in Vern's Bakery, at 9718 Dryrum Aven... the place at 10:35 P M. The younger one held his hand in ... coat pocket...

Auto Strikes Man Carrying Box

A man carrying a bo 93rd st. near Putnam short... afte...

C&D BATTERIES, INC.

of Conshohocken, Pa.

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

Communist machine-gun fire dropped him in combat. But whole blood kept him alive, saw him through the hospital. He thanks you for his life.

She'd been exposed to polio. A new serum, *Gamma Globulin*, made from blood, helped ward off the dread disease. She thanks you for her life.

A tornado whipped suddenly across her home town. She was badly injured by falling debris. But a quick operation, several transfusions pulled her through. She thanks you for her life.

Three grateful people say: "we're HERE... because you were THERE!"

Each one of these people is alive today because someone gave blood.

If you've given blood before, you know how easy it is—how quick and painless. And you know what a wonderful feeling it is when you realize that what you've done may give another person his life.

Now you are asked to give blood . . . again and again. And you can do it safely every 3 months.

Because America's need for blood has increased enormously—for our armed forces, for accident and disaster victims at home, for new disease-fighting serums.

Many a life hangs in the balance! Will you help? Call your Red Cross, Armed Forces or Community Blood Donor Center today!

BUSINESS EXECUTIVES CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

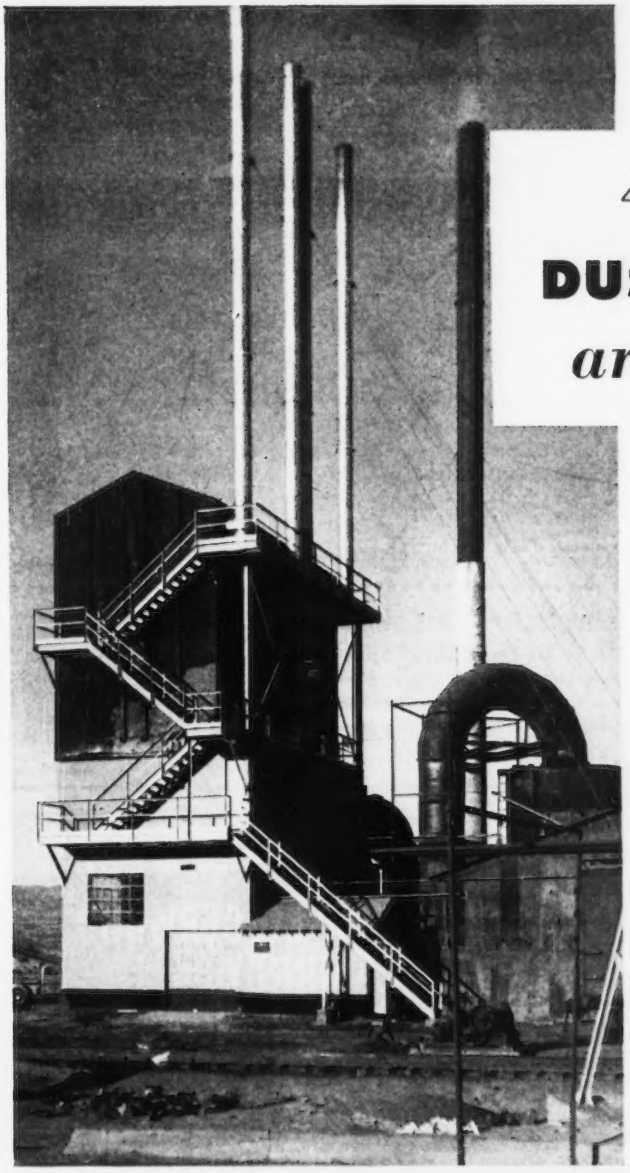
- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLANT BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOODMOBILE MAKE REGULAR VISITS?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . the need for blood is **urgent!**

NATIONAL BLOOD PROGRAM

GIVE BLOOD

...give it again and again



Custom designed continuous automatic Dustube Collector filtering 25,000 c.f.m. gases from a Dwight-Lloyd Sintering Machine at the New Jersey Zinc Company, Empire Zinc Division, Canon City, Colo.

4 reasons why **DUSTUBE® collectors** *are your best buy*

1. UNIFORM RECOVERIES APPROACHING 100%

of the fume entering the Dustube cloth type collector are commonplace. It is the most dependable method of dust removal that will insure a "clean stack" under wide variation in operating conditions.

2. HANDLES HOT, CORROSIVE GASES

A fundamental approach to cooling equipment design plus a wide selection of filter fabrics, including new synthetics, has increased the scope of cloth filtration. Gas at initial temperatures as high as 2000° F. can be economically cooled and filtered at temperatures well above the dew point.

3. RUGGED SIMPLICITY, ECONOMICAL OPERATION

Dustube Collectors have the inherent capacity for continuous, severe service with a minimum of down time. Automatic units can be designed to permit interior inspection and maintenance without shutting down. Capital investment and operating costs are very reasonable.

4. APPLICATION ENGINEERED

Dustube Collectors are available in either standard units or they can be individually designed to fit existing or new plant buildings and flue lines. Collected material can be automatically discharged and conveyed to a common point for reprocessing without dewatering, filtering or drying.

NEW *40 page catalog*

contains practical charts and useful engineering data. Write today for your free copy of Catalog 72-B.

American
WHEELABRATOR & EQUIPMENT CORP.
438 S. Byrkit St., Mishawaka Ind.

dustube®
COLLECTORS

STRAUB

HAS RIB-CONE MILLS FOR ALL GRINDING OPERATIONS

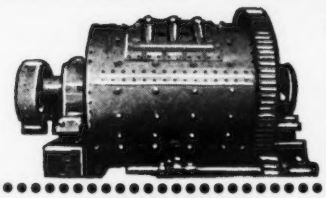
More than 100 sizes and types of ball mills. 40 years of experience in supplying every conceivable grinding requirement is at your disposal in the form of engineering counsel. *An inquiry to our engineering department will bring a prompt reply.*

STRAUB MFG. CO.

622 CHESTNUT STREET • OAKLAND 20, CALIF.

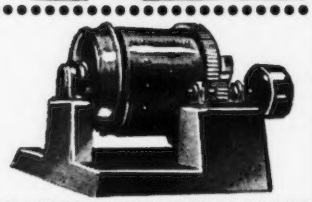
SECTIONALIZED MILL

Completely assembled in our shop, then marked and knocked down for shipping "Anywhere a Mule Can Go."



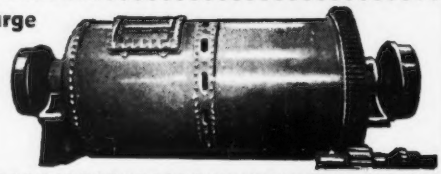
SCREENING MILL

Most economical type. Particularly suited to amalgamating and concentrating classes of ores. Capacity from 2 to 95 tons per 24 hours.



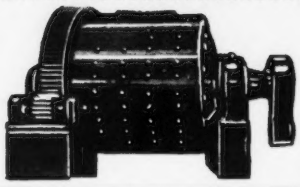
Peripheral Discharge MILL

Particularly suitable for producing a granular product. Designed for controlled grinding of tungsten and similar ores where sliming must be eliminated.



LOW PULP LINE MILL

One of the new Champion Series. Available in low pulp line, plain overflow, screening and convertible types with capacities ranging from 25 to 250 tons per 24 hours.



★ More than 100 Sizes and Types of RIB-CONE Ball Mills

NOW-

THE CLARKSON MODEL E REAGENT FEEDER IN RIGID PVC

- ACCURATE
- ECONOMICAL
- CORROSION-PROOF
- WIDE FEEDING RANGE
- COMPLETE DEPENDABILITY

A PROVEN TOOL—A NEW FORM

The Clarkson Model E feeder, long a standard of the mining industry, is now offered in **rigid** polyvinyl chloride. Every part—even the screws and nuts—is machined or molded from pvc, the material which has achieved sensational industry acceptance because of its remarkable corrosion resistance characteristics. The Model E in pvc gives you the **same** high accuracy and low cost of other Clarkson feeders PLUS corrosion resistance that makes it an even more versatile and valuable industrial tool.

For additional information, write today for Bulletin 541.

THE CLARKSON COMPANY

564 MARKET STREET
SAN FRANCISCO 4, CALIF.

SUPERIOR-LIDGERWOOD MUNDY CORPORATION

The First Name in

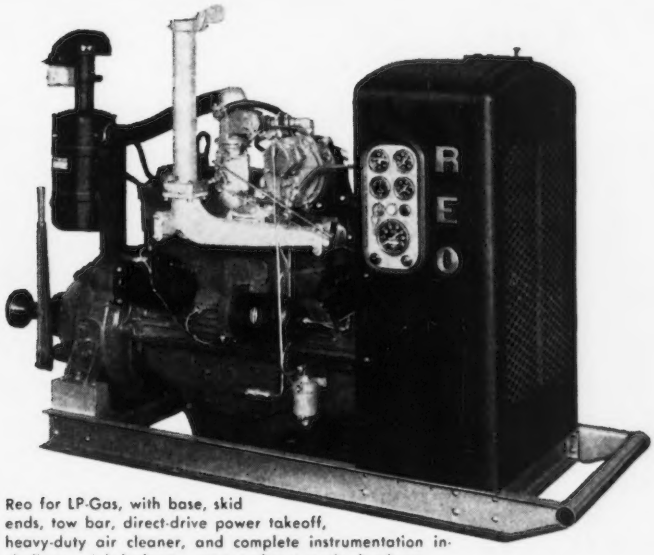
Hoists
carpullers

To learn more about this quality hoisting equipment, write for bulletin H 414

SUPERIOR-LIDGERWOOD-MUNDY CORPORATION

MAIN OFFICE AND WORKS—SUPERIOR, WISC.

New York Office: 7 Dey Street, New York, N. Y.



Reo for LP-Gas, with base, skid ends, tow bar, direct-drive power takeoff, heavy-duty air cleaner, and complete instrumentation including a visual alarm system and automatic shutdown.

NOW REO RELIABILITY in packaged power

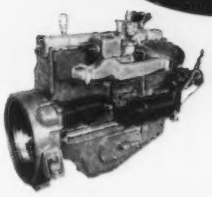
More Heavy-Duty Features . . . Lower Operating Costs

Dependability! Economy! These two "musts" now can be *yours* in Reo Industrial Power Units.

You get world-famous Reo spark-ignition engine design—already used on well over 100,000 military and commercial vehicles—skillfully adapted to industrial needs. A wide choice of supplementary equipment for special applications is available.

Replaceable wet cylinder sleeves eliminate *costly* reboring. Reo overhead valve design provides more efficient combustion. Seven main bearings with interchangeable inserts assure long-lasting smooth operation. You get an integral oil cooler, a full-flow oil filter, a large-capacity oil pump, and a fully controlled bypass cooling system, plus all of the heavy-duty Reo features military and civilian operators appreciate.

Reo Industrial Power Units are *factory-built* to operate on gasoline, natural gas, liquefied petroleum gas, or in dual-fuel combinations. For every service or service requirement from 50 to 180 continuous horsepower, you can look to Reo for the experience and quality that mean *outstanding* engine performance. Parts and service coast-to-coast. Write for specifications and the name of nearest dealer.



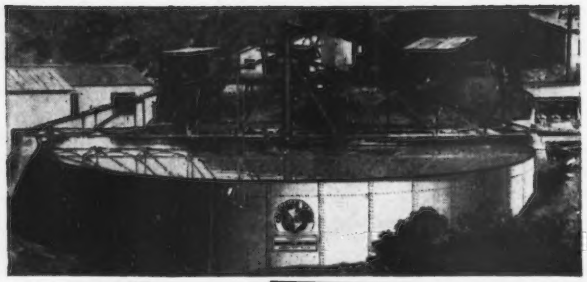
Basic Reo Gasoline Industrial Engine. Designed for continuous operation even when tilted 15°.

Reo with base, full hood, and side panels. Either right-hand or left-hand rotation is available.

EXCELLENT FOR . . . stationary, portable, or mobile power in the pit and at the plant. Engine is available with variable-speed governor; normal-duty air cleaner, or heavy-duty with precleaner; 6 or 12-volt ignition and starting; direct-drive PTO, reduction-gear-drive PTO, fluid coupling, or spring-loaded clutch; 3½", 4", 6", or 7" channel base; radiator, or expansion tank for use with remote cooling coils; blower or suction cooling fan; exhaust pipe with heat shield and rain cap; partial or full hood; instruments. We'll be glad to recommend the right complete engine for your specific needs.

INDUSTRIAL & MARINE ENGINE DIVISION

REO MOTORS, INC., Lansing 20, Michigan



QUICK SHIPMENT

COLUMBIAN BOLTED STEEL MINING EQUIPMENT

AGITATORS • THICKENERS • SOLUTION TANKS • ORE BINS, ETC.

No costly delays. Your order is handled in record time by an expert staff of engineers and designers. Then it is fabricated in one of the best equipped manufacturing plants in the Mid West, with modern presses especially designed for the purpose.
Lower your costs with Columbian Mining Equipment for permanent installation, yet portable if change in location is necessary. Standard construction for domestic use or for export by ocean freight. Special if for export via mule-back or aeroplane to final destination. Order from distributors listed below—or write direct for complete facts.

COLUMBIAN STEEL TANK CO.,
P. O. Box 4048-D, Kansas City, Mo.

Distributors in the United States

Denver Equipment Company, 1400 Seventeenth Street, Denver, Colorado
Elmco Corporation, 634 South 4th West Street, Salt Lake City, Utah

Distributors — Foreign

Avenida Ejercito Nacional 458-D Colonia Chapultepec Morales, Mexico, D. F.

HOW ABOUT IT?

16% POWER REDUCTION
60% REAGENT REDUCTION
50% TAILING REDUCTION

— 30% —

INCREASED CONCENTRATE GRADE

THAT'S WHAT BOOTH FLOTATION IS DOING AT ONE PLANT.

— INVESTIGATE —

YOU CANNOT LOSE IF YOU USE BOOTH FLOTATION MACHINES

WRITE FOR INFORMATION

BOOTH ENGINEERS

146 SO. WEST TEMPLE • SALT LAKE CITY, UTAH

MINERALS SEPARATION • SERVICE • EQUIPMENT

A tip for top performance

TeeCee
TUNGSTEN CARBIDE

&

"TYPE L"
ONE PASS STEEL

LIDDICOAT

DETACHABLE DRILL BITS

MANUFACTURED BY

Thompson Products

THOMPSON PRODUCTS LTD. • ST. CATHARINES, ONT.

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Gold Tin Columbite Titanium Bauxite

Most accurately and economically tested for . . . with the

EMPIRE DRILL

NEW YORK ENGINEERING COMPANY

75 West St., N. Y. City, U.S.A. Cable Address NYECO, N.Y.

CORE DRILLING

—anywhere!

"We look into the Earth"

- Mineral Prospecting
- Foundation Test Borings and Grouting
- Large diameter holes for Ventilation and Escapeways

PENNSYLVANIA Drilling CO.

DRILLING CONTRACTORS & MFRS.

1205 Chartiers Ave. PITTSBURGH, PA. WAlnut 1-5816

"RECORD MAKER" Makes Conveyor Loads "PAYLOADS"

Speed up operations above and below ground by specifying Republic Rubber's Record Maker Conveyor Belting . . . **a belt made specially for handling sharp-edged, mined products.** Record Maker is a resilient, rubber-covered belt that resists abrasion, wards off cutting blows and keeps steadily on the MOVE despite the constant flexing, buffeting and impact it receives in mining operations.

An extra tough cover, plus Republic's special anti-mildew treated fabrics, used in the ply construction, gives Record Maker Belting an **increased work capacity** that means longer life and bigger profits for you.

Call in your local Republic Distributor for service on all Industrial Rubber Products. If his name is not listed in the yellow pages of your phone book, write directly to us.

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

All business is specialized

. . . and nothing specializes on your business like your business paper

Here's a smart bird who knows how to sell fast. He *specializes* . . . picks cold customers who are hot prospects!

Specializing is profitable in your business, too. That's why this business paper of yours is so important. It means no frustrating scrounging for facts you need. A whole staff of editors scouts the country for you . . . and lines up new ideas, the facts about new products and materials, the profit slants on your business—in article after article—like a row of sittin' ducks.

And the ads help, too! They talk business . . . your business . . . helping you slice a cost here, an hour there . . . showing you new products, explaining new techniques, telling where to buy what. Like you, all the best informed people in your field read them carefully, clip and file them for reference . . . pass them along. Fact is, there are few ways for people-moving-ahead to get so much data for so little . . . or to find so much *specialized* help anywhere as you get in your business paper every single month.

This business paper in your hand has a plus for you, because it's a member of the Associated Business Publications. It's a paid circulation paper that must earn its readership by its quality . . . And it's one of a leadership group of business papers that work together to add new values, new usefulness, new ways to make the time you give to your business paper still more profitable time.

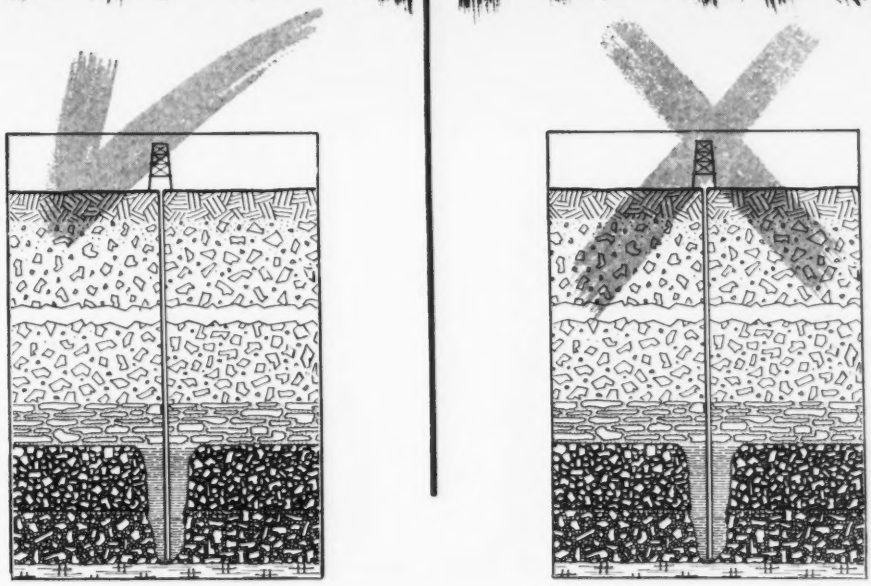
A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet." Room 2710.

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd St., New York 36, N. Y.

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

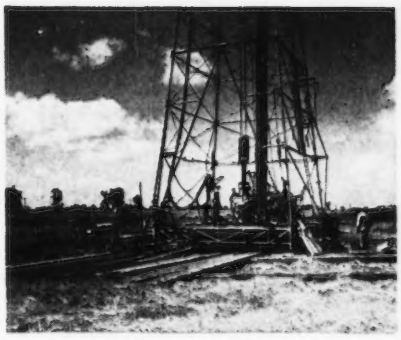
SULPHUR

...why can't *Every* dome produce sulphur?



The production of sulphur in the Gulf Coastal Region of Louisiana and Texas by the Frasch Process, is from underground natural beds found in "domes." However, very few domes have been found to contain sufficient sulphur, if any, to be brought into production.

It is estimated that nearly 200 dome structures along the Coast of the Gulf of Mexico have been investigated over the last half-century but only fourteen have produced sulphur in quantity.



And the presence of sulphur, even in quantity, doesn't always mean a successful producer. Some years ago a dome was found, explored, and proved with the result that a plant for the production of sulphur was erected at a cost of several million dollars. Later it had to be abandoned because the underground conditions did not lend themselves to the use of the Frasch Process.

A dome is a sulphur mine only when it can be worked economically and produce sulphur in commercial quantities.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Sulphur Producing Units

- **NEWGULF, TEXAS**
- **MOSS BLUFF, TEXAS**
- **SPINDLETOP, TEXAS**
- **WORLAND, WYOMING**

706,585 TONS LOADED BY 1 LORAIN IN 4½ YEARS

Niagara Stone Company of Niagara Falls, New York, bought a 1¾ yd. Lorain Shovel, model L-80, back in July, 1948. Since that time, the Lorain has worked steadily in their quarry, digging dolomite limestone to feed the crushing plant. Each year, production increased at a steady pace and in 1952, more than 226,000 yards of material were loaded to meet increased demands. A grand total of 706,585 tons have been credited to this single Lorain in the 4½ year period.

Job records like this one are typical of the performance turned out by Lorains in pits and quarries — records that go back many years on some of the toughest digging any shovel can encounter. That's because Lorains are built for the rough, tough work in rock — built to take the most severe punishment and yet give steady performance year after year. When your job calls for a ½ yd. to 2 yd. class machine — as shovel, crane, dragline or clamshell — you can be sure there's a Lorain to fill your need. And you can also be sure Lorain quality will pay its way in steady production and profits.

THE THEW SHOVEL CO., LORAIN, OHIO

. . . AND WHY THERE'S MUCH MORE TOUGHNESS IN ANACONDA'S NEW MINING MACHINE CABLE

Your naked eye can't spot diameter differences in new cables. That's why it's important to check promptly when you *do* see variations in cable after it's been used. It has probably been crushed . . . by runovers or rib-pinching. Compression cuts may let in moisture *to shorten cable life.*

HOW TOUGH SHOULD CABLE BE?

As tough as we can make it—regardless of cost. One break in a cheap cable costs more than you can save by buying on price. The new ANACONDA Cables mean lower costs to you because they can take much more abuse. In fifteen mines recently surveyed, the average life of ANACONDA Cables on shuttle cars jumped 300% over cables used only a few years ago.

WHY THE NEW ANACONDA CABLES LAST LONGER

A stronger jacket, made from a new neoprene compound, resists heat, flame and moisture better. In wet mines, sliver-cuts that may cause shocks are less likely to occur. A new cold-rubber insulation means new toughness. Moisture-wise and puncture-wise both. A new type of stranding improves the flexibility of these cables under stress.

YOU BE THE JUDGE

Examine an ANACONDA Cable. See why these things are so. Call your nearest Anaconda Sales Office or Distributor for a sample. And remember: no ANACONDA Cable has ever failed a U. S. Bureau of Mines flame-test. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

53301

ANACONDA®

TODAY'S HEADQUARTERS FOR MINE CABLE

FLAT-TWIN CABLES FOR:
shuttle cars
continuous miners
loaders cutters
drill trucks

HI-VOLT CABLES FOR:
mine power

TYPE SH-D FOR:
shovels

TYPE SO FOR:
hand drills
remote control

TROLLEY WIRE
FEEDER CABLES
TELEPHONE WIRE
SHOT FIRE CORD
WELDING CABLES

Professional Services

ASSAYING
CONSULTING
PROSPECTING
ORE TESTING

RESEARCH
METALLURGY
MILL DESIGN
MINE MANAGEMENT

BEHRE DOLBEAR & COMPANY

Consulting Mining Engineers and Geologists

11 Broadway, New York 4, N. Y.

CALL IN A SPECIALIST TO SOLVE THAT PROBLEM

Experiment takes time—so why not save time by calling in a specialist who has already gone over the ground you are now exploring?

Engineering & Mining Journal, meeting place of mining men in all parts of the country, points the way to the solution of many milling problems through its Professional Service Section.

Why not tell one of these specialists about YOUR problems?

BLANDFORD C. BURGESS
Consulting Engineer
Industrial Mineral Specialist
Appraisals Mineral Surveys
Plant Design
Prospecting Development—Efficiency
Ground Water Studies
Box 350 Monticello, Ga.

V. CLAIBORNE KILBY
Chemist
Ore Analysis
Milton N. C.

RODGERS PEALE
Consulting Mining Geologist
315 Montgomery Street
San Francisco 4, Calif.

SPANSKI and WILLIAMSON
Engineers — Geologists
Groundwater Exploration
Mineral Prospecting and Evaluation
Investigations and Reports
P.O. Box 151 Springfield, Illinois

DICKINSON LABORATORIES
Assayers—Chemists—Metallurgists—Umpire Work
Ore Shippers Representatives at Local Plants
Samplers — Analysts at Mexican Border Points
1300 West Main St. El Paso, Texas

KELLOGG KREBS
Metallurgical Engineer
Mineral Dressing Consultant
564 Market St. Telephone:
San Francisco 4, Calif. SUtter 1-6613

AMEDEE A. PEUGNET
Consulting Mining Engineer
Telephone MAin 1431
705 Chestnut St., St. Louis 1, Mo.

MARVIN J. UDY
Inorganic Chemistry Electrochemistry
Electric Furnace Smelting
Process Metallurgy
Ferro-Alloys, Calcium Carbide, Phosphorous
Telephone 2-6294
546 Portage Rd., Niagara Falls, N. Y.

ABBOT A. HANKS, INC.
ASSAYERS—CHEMISTS
Est. 1866
Spectrographic Analysis
Shippers Representative
624 Sacramento Street
San Francisco 11

LEDOUX & COMPANY, Inc.
Metallurgical Chemists — Assayers
Spectroscopists
Samplers—Weighers
Representatives of Shippers of Ores and metals at Buyers Works
Office and Laboratories
359 Alfred Ave., Teaneck, N. J.

ROGER V. PIERCE
Mining Engineer Specialist
Underground Mining Methods. Cost Cutting Surveys—Production Analysis
Mine Mechanization—Mine Management.
1596 Wasatch Dr., Salt Lake City, Utah

WALKER & WHITE, Inc.
Umpire, Assayers, Chemists
Shippers Representatives
409 Pearl St. New York City

E. LEE HEIDENREICH, JR.
Consulting Engineers
Crushing Plants Quarries
Milling Plants Plant Design
Plant Layouts Appraisals
75 Second St., Newburgh, N. Y.
9 So. Clinton St., Chicago 6, Ill.

ROBERT S. MAYO
Civil Engineer
Complete Equipment for Concrete Lining of Tunnels, Haulageways and Shafts. Special Equipment for Underground or Subaqueous Construction.
Lancaster, Penna.

LUCIUS PITKIN INC.
Mineralogists—Assayers
Chemists—Spectroscopists
SHIPPERS REPRESENTATIVES
Main Office—Laboratories
Pitkin Bldg.—17 Fulton St.
New York 7, N. Y.

WEISS GEOPHYSICAL CORP.
Mining geophysical surveys with aerial and ground magnetic, gravimetric, seismic, and electrical methods. Experienced crews for systematic work in any part of the world.
P. O. Box 1188
Wilmington 99, Delaware

HERON ENGINEERING CO.
Consulting Engineers for all types of Aerial Tramways, Cableways, and Suspension Structures
2000 South Acoma St.
Denver 19, Colorado

ARNOLD H. MILLER
Consulting Engineer
General Mine, Mill and Industrial Appraisals
Plant Design, Mechanization and Improvement
Cable: "ALMIL." Tel. Cortland 7-0635
120 Broadway, New York 5

POWERS AND EVANS
Consulting Mining and Petroleum Geologists
307 Kaufman Building
Wichita — Kansas
Delmer L. Powers
David LeCount Evans
Tel. Wichita 4-7429

HARRY J. WOLF
Mining and Consulting Engineer
Examinations — Valuations — Management
420 Madison Avenue
New York 17, N. Y.
Cable: MINEWOLF
Tel.: Plaza 9-1700

HOLMES & NARVER, INC.
Engineers • Constructors
Design and Construction of Mining and Metallurgical Plants.
828 South Figueroa Street
Los Angeles 17
Trinity 8201

ARTHUR NOTMAN
Consulting Mining Engineer
55 Liberty St., 18th Floor
New York 5, N. Y., U.S.A.
Telephone BArclay 7-9484

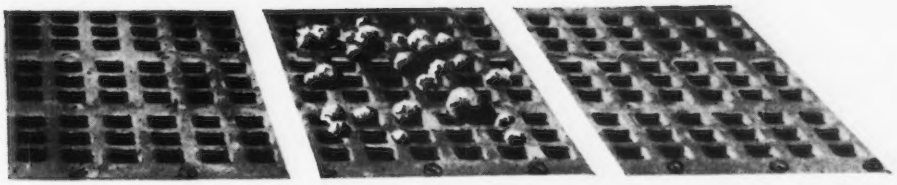
SMITH-EMERY CO.
Assayers and Chemists
SPECTROGRAPHIC ANALYSES
781 E. Washington Blvd.
Los Angeles 21, Calif.

WORLD MINING CONSULTANTS, INC.
Consulting Mining Engineers and Geologists
220 Broadway, New York 38, N. Y.
Worth 2-2934

Profitable Mine Operation—

calls for operating efficiency all along the line. These specialists in various phases of mine operation can aid you materially in determining quick, economical solutions to your mining problems that make for more efficient operations, resulting in lower costs and a consequent greater return on your investment. Consult them!

Before... and... After...



the screen is the same

Hendrick Perforated Metal Plate assures a long life of service on vibrating and shaking screens. Available in any desired shape or size of perforations, it can also be supplied flat or corrugated in proper gauges of regular, high carbon, and high tensile steels and in other commercially rolled metals.

Full open clearance reduces blinding to an absolute minimum. Decks can be changed fast and easily, saving valuable time and labor costs. Write for more information.

Hendrick

MANUFACTURING COMPANY

70 DUNDAFF STREET, CARBONDALE, PA. • *Sales Offices in Principal Cities*

PERFORATED METAL • PERFORATED METAL SCREENS • WEDGE-SLOT SCREENS
ARCHITECTURAL GRILLES • MITCO OPEN STEEL FLOORING • SHUR-SITE TREADS • ARMORGRIDS

at your BUSINESS service:

The Classified Advertising Sections (Searchlight Sections) of McGraw-Hill publications are at your service for the satisfying of almost every business need or want.

Because these publications are specialized in the field that they cover, your classified advertising of used or surplus new equipment, of securing a position or personnel, of offering or securing business opportunities will reach the right men, quickly and economically.

Classified Advertising Division

McGRAW-HILL PUBLICATIONS, Inc.

330 West 42nd St. **New York 36, N. Y.**

he's working for you

THIS FELLOW IS TRAINED IN YOUR BUSINESS. His main duty is to travel the country — and world — penetrating the plants, laboratories and management councils . . . reporting back to you every significant innovation in technology, selling tactics, management strategy. He functions as your all-seeing, all-hearing, all-reporting business communications system.

THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it"—"they" being all the industry's front line of innovators and improvers — and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you—giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL FOR BUSINESS

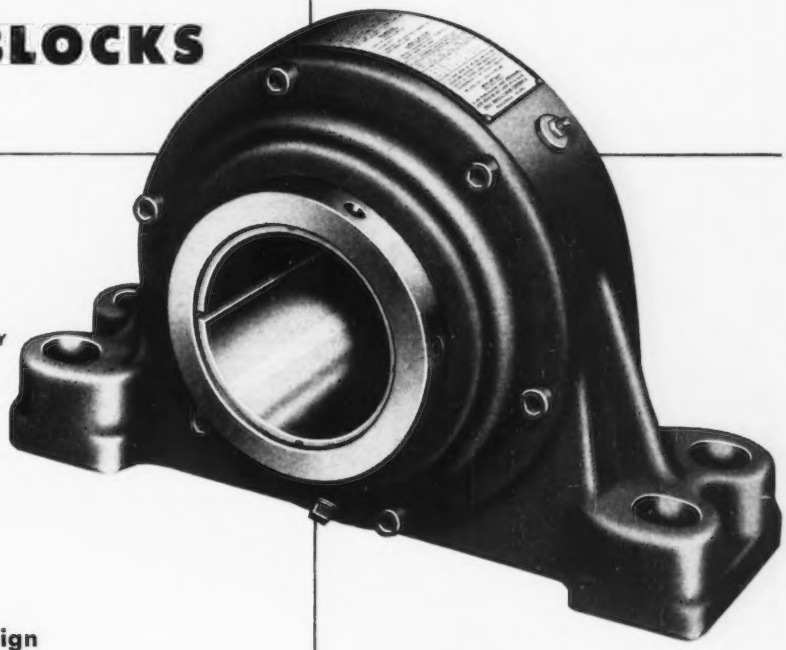
McGRAW-HILL PUBLICATIONS

NEW

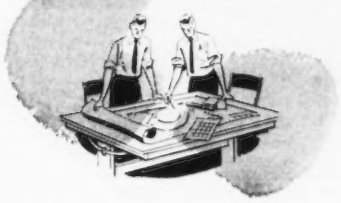
DODGE-TIMKEN ALL-STEEL PILLOW BLOCKS

HEAVY DUTY CAPACITY!

LESS SPACE! LESS WEIGHT!



A JOINT ENGINEERING DEVELOPMENT BY DODGE AND THE TIMKEN ROLLER BEARING COMPANY



- All-Steel construction
- A new Timken bearing design
- High radial and thrust capacities
- Compact—minimum dimensions
- Minimum weight with maximum strength
- Fully self-aligning with spherical outer race
- Both expansion and non-expansion types
- Adapter mounting, proven through the years
- Double piston ring seals
- Sealed both on and off the shaft
- Fully assembled, permanently adjusted, lubricated and sealed at the factory

Here are the bearings for industry's toughest jobs. High radial and thrust capacities. Stamina to take heavy shock loads. And all-steel construction packs this load-carrying capacity into less weight and less space. Engineers are already specifying "Dodge-Timken All-Steel" for some of America's largest projects. Write for details and delivery dates, or call your Dodge Distributor.

DODGE MANUFACTURING CORPORATION
3100 Union Street, Mishawaka, Indiana

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.

DODGE
of Mishawaka, Ind.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

$1.20 a line. Minimum 3 lines. To figure advance payment count 5 average words as a line. (See ¶ on Box Numbers.)
POSITION WANTED undisplayed rate is one half of above rate, payable in advance.
PROPOSALS, $1.20 cents a line an insertion.

INFORMATION:

BOX NUMBERS count one additional line in undisplayed ads.
DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).
EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE

The advertising rate is $12.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

Send NEW ADVERTISEMENTS to N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y. For February Issue closing January.

Metallurgical Consultant

Applications are invited from graduate Metallurgical Engineers, preferably in the age range 40 to 45, who have had not less than ten years broad and responsible experience in the field of nonferrous extraction metallurgy, for the position of Assistant Consulting Metallurgist to the undermentioned Corporation for duties in connection with the important group of Northern Rhodesian mining companies producing copper, cobalt, lead, zinc and other base metals, to which the Corporation acts as Consulting Engineers.

The salary to be offered will be commensurate with the successful candidate's qualifications and experience. Membership of the Corporation's Pension Fund will be a condition of employment.

Applicants must be prepared to take up residence in Kitwe, Northern Rhodesia. The cost of transportation of the successful candidate, his wife and children up to 18 years of age and reasonable personal effects will be borne by the Corporation. A modern three-bedroomed brick house, with essential furniture, will be made available at a rental which will not exceed $28.00 per month.

Excellent medical facilities are provided and recreational amenities are outstanding.

Initially the engagement will be for a period of three years, after which service may be extended indefinitely, but will be subject to six months notice of termination by either party. Repatriation privileges on the same scale as above will be granted at the end of three years service. Leave is generous and amounts at present to 60 days per annum which can be accumulated up to a maximum of 180 days.

Applications stating age, marital status, educational and professional qualifications and giving details of past experience and positions held should be addressed to:

Personnel Officer,
Anglo American Corporation of South Africa, Limited,
P.O. Box 4587, JOHANNESBURG.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

WANTED—SALES representatives in mining field to handle powdered, cleaner for the thousands of shower stall floors and walls in wash and change houses. Cleans quickly and easily where all other cleaners have failed. Removes iron rust, lime deposit, soap oil, body grease and algae formation. No scrubbing necessary. Leaves an almost slip-proof surface. Minimizes conditions that breed and distribute infectious germs. Not an ordinary all-purpose cleaner. Used in industry for 37 years. Tremendous potential. Sold on guaranteed-satisfaction basis. Commissions up to 38% on original order and all reorders paid on 10th and 25th each month. We can drop-ship direct to customer, eliminating warehousing. Literature and samples furnished. Write for further details. Berman Chemical Co., 712 Superior St., Toledo 4, Ohio.

SELLING OPPORTUNITY OFFERED

WE MANUFACTURE conveyors, crushers, feeders, truck scales & vibrating screens. Opportunities vailable for dealerships for those successful in selling mining, quarrying, material handling, chemical, mineral & food processing machinery. Bonded Scale Co., 97 Kingston, Columbus, Ohio.

POSITIONS WANTED

MGR.: GENL., Supt.; Dir. Research; mine exam. 58. S.B. Min. Eng. & Geol.; S.M. Process Met.; Sc.D. Process & Physical Metallurgy. Labor experience North and South America. Bilingual Spanish. Ample experience Geol., Min., Mill, Smelt., Eng. Adm., Railroads, Min. Exam., Constr., modern equipment. Excellent health. Married, no small children. Available immediately. Correspondence invited. PW-9924, Engineering & Mining Journal.

MECHANICAL ENGINEER desires foreign employment in Europe or Latin America. Age 35, married, one child. Previous Latin American experience. Spanish speaking. Fifteen years heavy experience in power, mining, construction. Presently employed by large construction firm. Available on short notice. Excellent references. Inquiries invited. PW-9791, Engineering & Mining Journal.

MINING ENGINEER, graduate, 46, family, extensive experience surveying and mapping, field and office. Want responsible position similar nature, permanent, surface operations, mining or other. Now employed, available reasonable notice. PW-1249, Engineering & Mining Journal.

MINING GEOLOGIST, 32 years, Ph. D., nine years experience in all phases of mineral exploration, mine work, ore estimation, research and administration desires responsible position with mining company, location anywhere, available on 40 days notice, PW-1216, Engineering & Mining Journal.

GEOLOGIST: CANADIAN, Queen's Graduate, 33, family. 11 years experience; 3 as miner; 8 years as exploration, mine and assistant chief geologist at gold and base metal properties (ferrous & Non ferrous) in Canada and West Africa. Desires responsible mining or geological work; available one month. PW-1217, Engineering & Mining Journal.

MINING ENGINEER, E.M. degree, 30 years experience on domestic and foreign mine examinations, management and underground operations. PW-1205, Engineering & Mining Journal.

WANTED

'Hungry' Manufacturer's Representatives

We are an established concern that designs and builds large industrial installations for air pollution control sold in the United States and Canada. We are willing to revamp our representation in any area to meet the competitive selling era ahead. Earning potentiality is high for the alert representative organization. If interested please write full particulars as to: territory covered, types of equipment presently handled, industrial fields contacted, and indications of success on other products of this type. Replies held in strictest confidence. Write care of this publication, Box RW1226
330 W. 42 St., N. Y. 36, N. Y.

MINING ENGINEER, B.S., 35, married. 4½ years experience underground; includes sampling, engineering, cave block operating, also familiar with square set methods; desire responsible position with opportunity for advancement. PW-1182, Engineering & Mining Journal.

MINING ENGINEER, 41, married, broad experience in western states. Desires responsible position in uranium mining. Professional Engineer. Presently employed. PW-1041, Engineering & Mining Journal.

ASST. MANAGER or Mill Superintendent, Mining and Metallurgical Engineer. 24 years of experience with large successful operations, competent with proven ability to get results. PW-9946, Engineering & Mining Journal.

MINING MANAGER or Chief Engineer, 39, married, three children, 15 years broad administrative experience all phases exploration, development, operation with large company in Bolivia. Reliable organizer and producer. Versatile engineering designer. Effective labor, government, public relations. PW-9973, Engineering & Mining Journal.

FOR SALE

Huesser short beam gold button balance 1/300 used about 2 months. Owner, 1230 E. 109th St., Los Angeles 59, Calif.

BUSINESS OPPORTUNITIES

Planning reopening richest and oldest gold mines in Cuba. Wish correspondence with possible associates; start modest, later enlarge operations. BO-1185, Engineering & Mining Journal.

For Lease copper-gold mine DMEA approved. 21 patented claims. 12 million production. Shipping ore in sight, equipment lacking. Large mill grade potential. Write C. F. Williams, 110 Camino Pena, Santa Fe, N. M.

SINCE 1898 DEPENDABLE RECONDITIONED MACHINERY

HOISTS—ELECTRIC

1—10 HP Vulcan #0 Single Drum
1—15 HP Morse New Single Drum
1—20 HP H&B Single Drum
1—22 HP Vulcan Single Drum #1½
1—30 HP Vulcan, Double Drum
1—30 HP Vulcan Single Drum
1—37 HP Single Drum
2—52 HP Vulcan #4½ Single Drum
1—50 HP Fairbanks-Morse Single Drum
1—60 HP H&B Single Drum
1—60 HP Vulcan #23ELF Single Drum
4—100 HP Box Single Drum
1—112 HP Vulcan Single Drum
2—150 HP Vulcan Single Drum
1—350 HP Dillon-Box Single Drum
1—600 HP Box Single Drum
1—22 HP Vulcan #1½ Double Drum
1—60 HP Ottumwa Double Drum
1—40 HP American 3 Drum
1—80 HP Thomas 3 Drum
1—80 HP Lidgerwood
1—80 HP Clyde 3 Drum

FILTERS

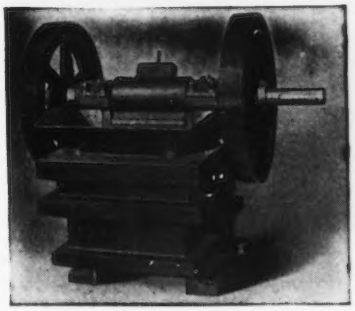
1—6' 2-disc American Filter
1—6' 3-disc American Filter
1—18" Morse Round Patern Filter Press
1—36" Merrill Triangular Filter Press
1—#12 Sweetland Filter Press, 36 leaves

FLOTATION MACHINES

1—New Morse Jetair 2 cell #7
1—29 x 7 Fagergren Single Cell
1—6 cell 18" Stearns-Roger
2—6 cell Denver "Sub A" #21
1—New Morse Jetair 6 Cell #30

PORTABLE COMPRESSORS

1—105 CFM Ingersoll Rand Portable Driven by 4 Cylinder Gasoline Engine
1—210 Worthington "Blue-Brute" Portable Driven by Continental 6 Cylinder Gasoline Engine
1—240 CFM Schramm Portable Driven by Buda 4 Cylinder Gasoline Engine
2—310 CFM Gardner Denver Driven by Buda 4 Cylinder Gasoline Engine
1—310 CFM Sullivan driven by Buda 4 Cylinder Gasoline Engine



CRUSHERS

4—2¼" x 3½" New Morse Lab Jaw Crushers
5—4" x 6" New Morse Lab Jaw Crushers
1—9" x 14" Universal Jaw Crushers
1—9" x 15" Wheeling Jaw Crusher
1—9" x 15" Farrell Jaw Crusher
1—9" x 16" Universal Jaw Crusher
1—8" x 24" Rogers Jaw Crusher
1—8" x 36" Universal Jaw Crusher
1—11" x 18" Universal Jaw Crusher
1—24" x 13" Farrell Jaw Crusher
1—10" x 16" Hercules Jaw Crusher
1—36" x 48" Jeffrey Flextooth Crusher
1—26" x 18" Williams Hammermill
1—30" x 17" Williams Hammermill

DRYERS

1—3' x 16' Bartlett & Snow Rotary Dryer
1—7'6" x 125' Mosser Rotary Kiln

LOCOMOTIVES

1—2-2½ ton Whitcomb Battery, 24" gauge
1—2½ ton Jeffrey battery or trolley, 36" gauge
1—3½ ton Mancha battery, 25" gauge, with 2 sets Edison batteries and charging set
1—3½ ton Mancha battery, 24" gauge
1—4 ton Westinghouse battery, 24" gauge
1—4 ton Ironton battery, 36" gauge
2—7 ton General Electric permissible battery, 36" gauge
1—7 ton Atlas battery, 36" gauge
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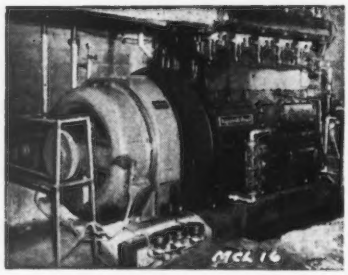

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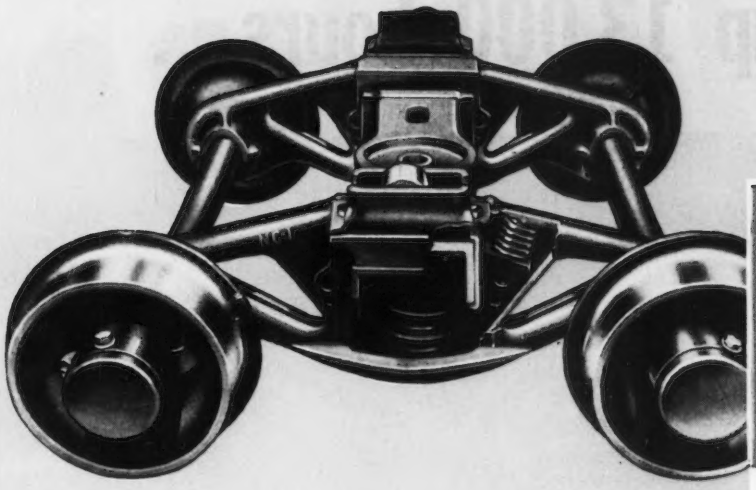
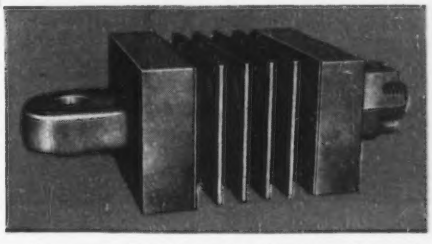


The NC-1 Truck climaxes 20 years of intensive research, providing (through the friction control mechanism shown in cutaway) protection to equipment, roadbed and lading with maximum wear life.

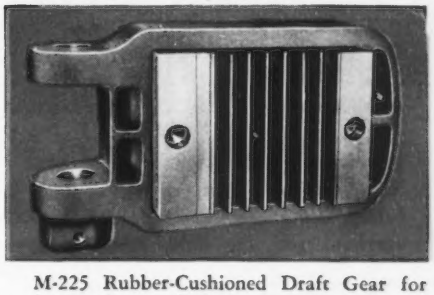
Willison Automatic Couplers save time with maximum safety . . . can be coupled at either end of car or locomotive . . . require no manual assistance. Close coupling eliminates damaging slack, permits high speeds with maximum stability.

NATIONAL *products cut per ton costs!*

Latest example of National's pioneering in better equipment is the NC-1 Truck. Its sweeping advancements over conventional trucks include long soft springs, a friction mechanism—controlling vertical and transverse oscillations, a cast one-piece bolster with large lubricated center connection, and automatic frame alignment. The NC-1 has been designed with the same factor of safety that is required by the Association of American Railroads for full size railroad trucks, and embodies the same features which A.A.R. tests have shown to be essential to produce good riding qualities. For the best in profitable equipment, *always specify National products.*



National M-230 Rubber-Cushioned Draft Gear for cars operating through rotary dump. Soft initial-action, high-capacity rubber pads provide maximum impact protection, lengthen equipment life. Available in a range of capacities and design variations to fit individual requirements.



M-225 Rubber-Cushioned Draft Gear for locomotives and large capacity cars not required to operate through rotary dump. Maximum protection in minimum space.

A-3862

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio

Willison Automatic Couplers • Friction & Rubber Draft Gears • Car Trucks • NACO Steel Wheels • NACO Steel Links & Swivel Hitchings

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY Est. 1868

They piled up 13,000 hours...

without overhaul

BETWEEN them, these two Caterpillar D7 Tractors with No. 7A Bulldozers have worked more than 13,000 hours before being overhauled. One has 6000 hours with no overhaul yet; the other went more than 7000 before visiting the shop. Owned by Bob Hawkins Construction Co. of Fort Deposit, Ala., they are shown 'dozing out settling basins at an iron ore stripping operation for Greenville Mining Co.

Ore averages 46-55%. Dirt must be removed regularly from the basins after settling. That means summer and winter operation for these sturdy yellow machines. Quick-starting, they need no pampering even on coldest winter days. They have stamina to work in frozen materials, and balance and traction to keep going when it's sticky underfoot. They're built to work the year around—or as far into the winter as *you* want them to work, and then get you off to an early start again in the spring.

These are all reasons why many mining operators winterize with Cat* machines. These big yellow bruisers pay off the year around with dependable high production. They stand up to equipment-busting mine work, thanks to extra-sturdy construction and special high-strength steels.

Your Caterpillar Dealer offers a wide range of tractors and matching bulldozers. He will arrange a practical, on-the-job demonstration of the dependable Cat-built team that suits your job to a "T." Call him now—and count on him whenever you need fast, skilled service and genuine Caterpillar parts.

Caterpillar Tractor Co., Peoria, Illinois.

CATERPILLAR*

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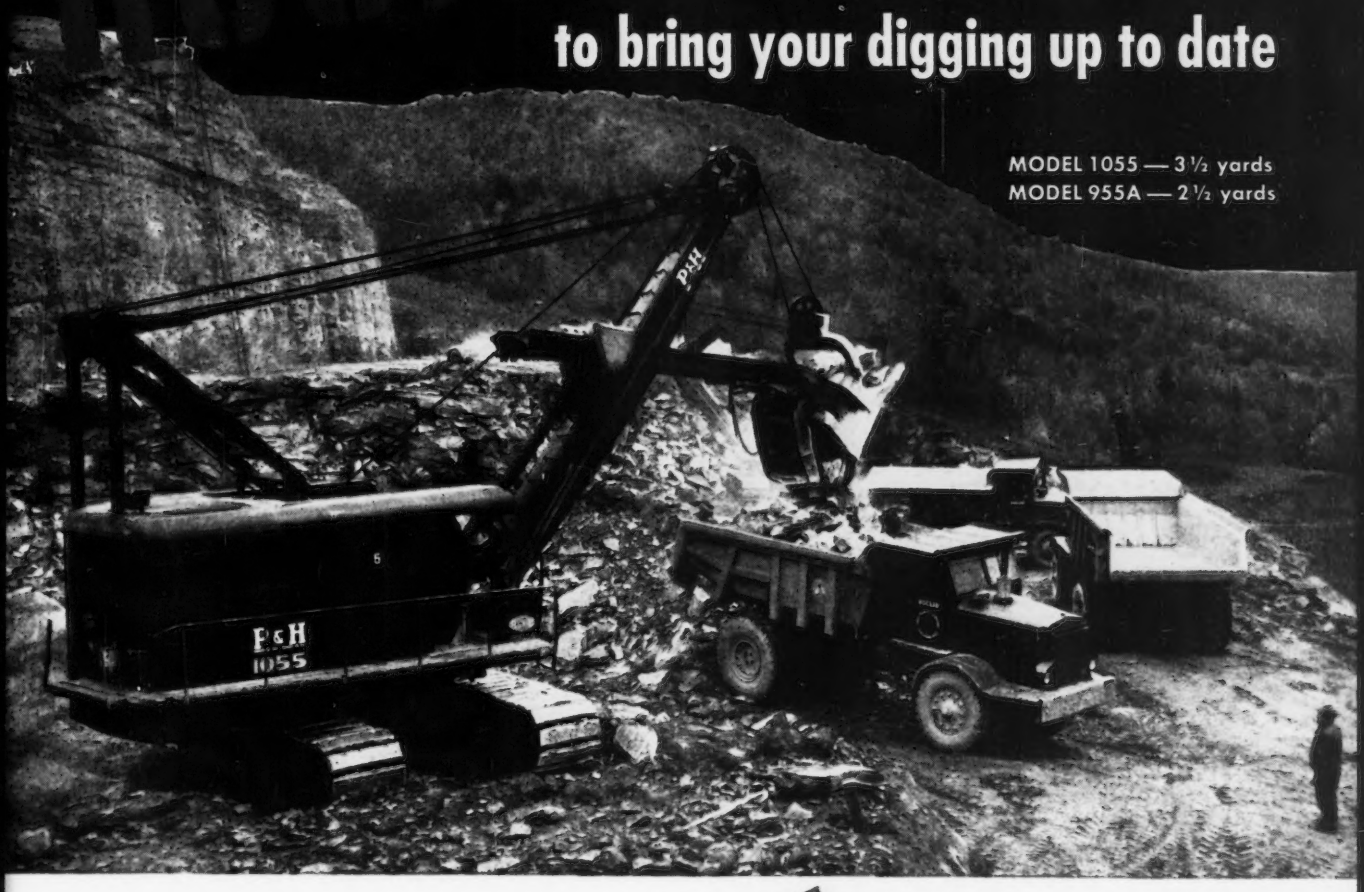
WINTERIZE YOUR JOB WITH CAT EQUIPMENT

ROCK RATED

to bring your digging up to date



You have the jump on costs when your new P&H takes over the tough digging jobs. Why? Because there's no other machine to match its performance. You have the speed — a 15% to 25% faster digging cycle — for bigger production. You have the all-welded strength to take shock loads that would K.O. less rugged machines. You have the stability to exert more power at the tooth point. That gives you added capacity.

If you're ready to cut your costs, these P&H's are ready to help you.

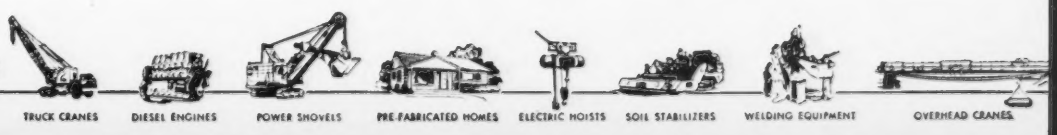
P&H MAGNETORQUE*
ELECTRIC SWING

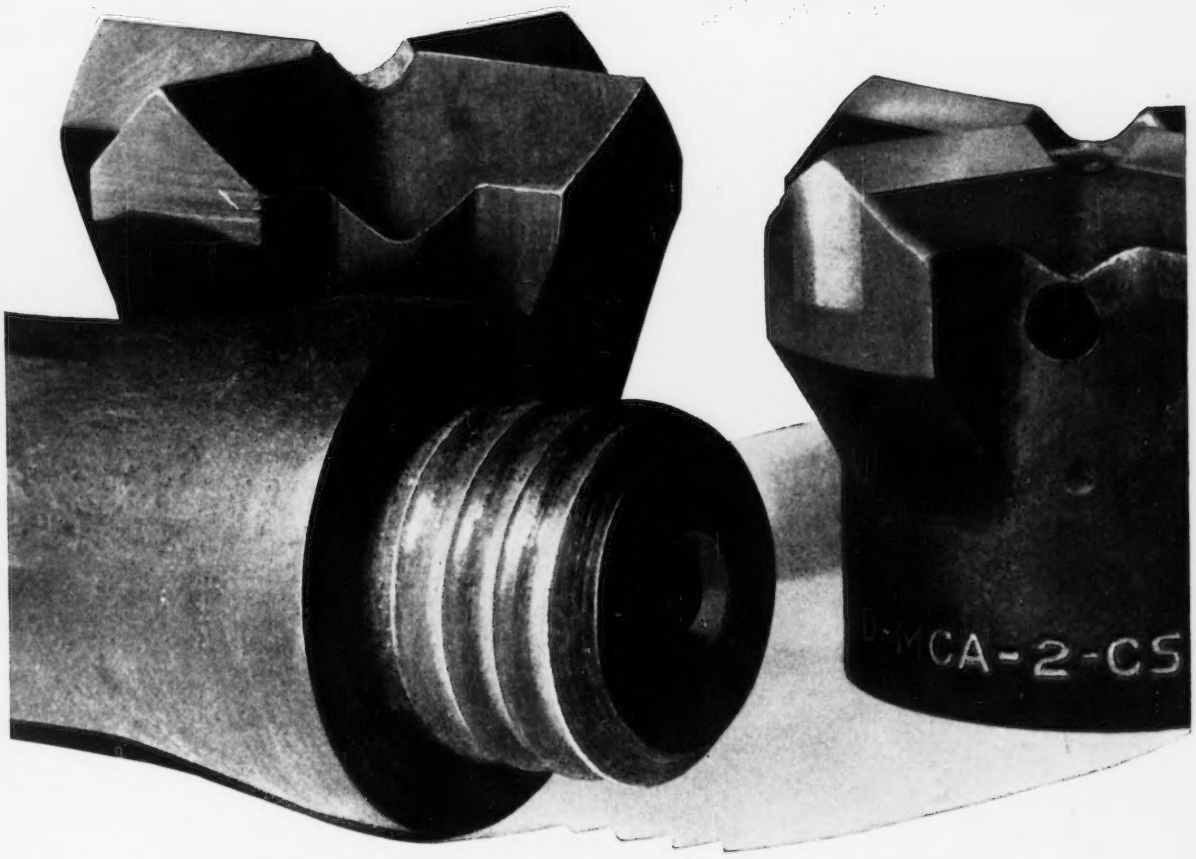
the greatest shovel improvement in 20 years. It's smoother, faster, more dependable. It eliminates the old swing frictions with their constant headaches and replacement costs. Magnetorque lasts the life of your machine. You should know the facts about it!

**T.M. of Harnischfeger Corporation for electro-magnetic type coupling.*

P&H LARGE EXCAVATOR DIVISION
HARNISCHFEGER CORPORATION
MILWAUKEE 46, WISCONSIN

the P&H Line





SWITCH BITS WITHOUT SWITCHING STEELS

DOZENS OF DIFFERENT TIMKEN® ROCK BITS FIT THE SAME DRILL STEEL

With Timken® rock bits, you can quickly change bit types as the ground changes. That's because dozens of different Timken rock bits—both multi-use and carbide insert—fit the same drill steel. When the ground changes, it takes just a minute to screw one type of Timken bit off, screw the other type on.

You don't waste drilling time by going after a different set of drill steels every time a different type of bit is needed.

You can cut your drill steel inventory, too. And you can save even more money because your drillers always can use the most economical bit for the job.

Both Timken multi-use and carbide insert bits give you two additional advantages: 1) they're made from electric furnace Timken fine alloy steel, 2) they have a special shoulder union that keeps the drilling impact from damaging threads.

Get help with your drilling problems from our rock bit engineers. They're experts at cutting costs. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

WHERE TIMKEN MULTI-USE BITS CUT COSTS

Most economical for ordinary ground. With correct and controlled reconditioning they give lowest cost per foot of hole when full increments of steel can be drilled.

WHERE TIMKEN CARBIDE INSERT BITS CUT COSTS

Give highest speed through hard, abrasive ground. Also most economical for constant-gage holes, small-diameter holes, very deep holes.

. . . your best bet for the best bit . . . for every job

TIMKEN

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